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THE JOURNAL OF PERIODONTOLOGY is published to serve as the professional journal of periodontia; to keep dentists in touch with research being carried on in this field and related sciences; to stimulate greater interest in the supporting tissues of the teeth and their relation to oral and general health. The plan to continue the publication of abstracts indefinitely will make the Journal a fund of extensive information, readily available to students, teachers, researchers, and clinicians.

The Journal is the official organ of the American Academy of Periodontology and will contain, therefore, those papers of scientific and clinical interest which are presented at the annual meetings of that society.

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The "Opinion" of Pierre Fauchard on Gingival Massage 200 Years Ago

The loss of the teeth can be avoided by the following means: "That is to keep the teeth very clean, deplete the gums when they need it by rubbing them vigorously every day with the end of the fingers" dipped in certain medicaments. Without proper care, the pus will consume the alveoli, so that the teeth become loose and fall out.

Extract from Book Review
See page 84.

THE JOURNAL OF PERIODONTOLOGY

APRIL, NINETEEN HUNDRED FORTY-EIGHT

A Summary of Periodontal Research Findings

By T. SYDNEY SMITH, D.D.S., F.A.C.D., F.I.C.D., *San Francisco, California*

RESEARCH investigation has revealed important new facts regarding the tissues that become involved in periodontal septic lesions. A review of these findings and the effect they may have on the treatment of these lesions is important.

In 1921 Fleischmann and Gottlieb (1) called attention to the apical migration of epithelium on the surface of the cementum beyond the bottom of the periodontal pocket. In 1946 Gottlieb (2) published a series of photomicrographs showing extreme cases of apical migration of epithelium to delay the destructive action, for it is a protective tissue.

These photomicrographs show another protective action of the epithelium during the development of the pocket. When the epithelium separates from the cementum on its coronal end, it clings to the separated surface of the connective tissues and frequently covers it. This epithelial covering is usually thin and seldom shows any sign of the deep interlocking with the connective tissue that is found in the gingiva. It is difficult to remove this epithelium surgically and it is the chief hindrance in getting the connective tissues to form an organic union with the cementum. This difficulty will be discussed more fully later.

These photomicrographs also show the important fact that the bone adjacent to the pocket is always resorbed or decalcified beyond the deepest portion of the apical migration of the epithelium. Therefore, any rebuilding of this lost bone is proof that there has been an organic reunion of the connective tissues with the cementum.

It is evident that the photomicrographs, showing migration of epithelium and loss of bone in Gottlieb's 1946 paper, were made from badly neglected cases where unhygienic conditions had existed for some time and the pockets developed from crevices that started in the bottom of the gingival sulci.

Orban (3) recently stated: "Approximately 85 per cent of all periodontal disturbances are caused mainly by local factors. Only in the remaining 15 per cent of periodontal diseases do systemic factors play a more important role."

Goldman (4) describes a very different kind of periodontal destruction that was caused by one of these systemic conditions. His full description of the material used in this investigation is helpful in understanding the periodontal

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destruction he discovered. He states:

> This study was made on the jaws of two spider monkeys (Ateles Geoffroyi) which originally belonged to a group of twenty-five animals used for behavior and nerve regeneration experiments. These monkeys were kept in a large enclosure and were fed exclusively on waste, fruits, and vegetables. During the experiments the monkeys became infected with amebic and bacillary dysentery. Six died and in all cases showed ulcers of the stomach or intestine, in most cases with perforations. The two jaws studied came from the last group mentioned.

In describing the condition of the dental structures, he writes: "The periodontal membrane showed the main changes of this disease, the early alterations appeared as a loss of the functional structure of the periodontal membrane, the principal fiber apparatus becoming disorganized." He explains this by saying: "The disintegration of the principal fibers seemed to arise in the middle portion of the fiber, the attachment to the cementum and bone persisting for a time." When the degeneration reached a more advanced stage, he says: "Sharpey's fiber attachments to the cementum and bone, however, are still evident. Increased edema and numerous capillaries are seen. No resorption of the bone can be detected." Even when the periodontal membrane consists entirely of loose, hyperemic, edematous connective tissue, he states: "One may notice that no bone resorption can be detected." He found that the epithelium, in these cases, did not migrate down on the surface of the cementum until the periodontal membrane adjacent to the epithelial attachment became affected and he explains this by saying: "In the second stage in areas where the periodontal membrane adjacent to the epithelial attachment becomes affected, proliferation of the epithelial attachment alongside the cementum takes place. With subsequent separation of the epithelium from the cementum, pockets form."

Gottlieb (5) originally stated: "As long as connective tissue fibers are anchored in the surface of the cementum below the epithelium attachment, a downward growth of the latter is obviously out of the question." But he also claims that it is the condition of the cementum that causes the fibers of the periodontal membrane to become detached. On this highly controversial problem he makes the following statement (6): "Gingival recession and pocket formation are produced by pathology of the cementum adjoining the epithelial attachment." Fortunately, however, Gottlieb gives what appears to be the true cause for the separation of the fibers of the periodontal membrane from the cementum and the downward extension of the epithelium to replace them, for he wrote the following (7): "The continuous deposition of new cementum inside the epithelial attachment forms the barrier, over which epithelium cannot grow. When such a cementum layer becomes calcified and old, without getting a new layer deposited on top, the barrier stops being effective and the epithelium grows down apically."

This statement leaves no doubt that it is the failure of the periodontal membrane to form the necessary new layers of cementum, and not pathology of the cementum, that causes the fibers to separate when they become calcified and old. Calcification of the older portions of the fibers is a normal, metabolic process and should not be called a 'pathologic' action.

Gottlieb supports the belief that the failure to deposit new cementum is caused by a disturbance of the periodontal membrane, for he says (8): "Some systemic institution is apparently responsible for the continuous cementum deposition. If a disturbance of that mechanism goes on for a considerable time the epithelium succeeds in closing the hole, that means the teeth are eliminated."

Orban and Mueller (9) give a reason for this disturbance of the periodontal membrane that prevents it forming new cementum. They state: "Microscopically, inflammation may always be found in the subepithelial gum tissue. Seldom does one find human specimens without some signs of inflammation." The inflammation they mention was adjacent to the epithelial attachment, where it could cut off the connective tissue fibers and allow the epithelium to migrate downward.

In Gottlieb's 1946 paper, before mentioned, he shows cases of extensive apical migration of epithelium where no inflammation can be detected. But that does not mean that there was no inflammation present before the epithelial extension developed. He explains how that could happen, in an earlier paper, by saying (10): "Thus, we must assume that, in cases of downward growth of the epithelium in connection with an inflammation, the latter alternately arises and passes off, first destroying the connective

tissue fibers and then disappearing to allow passage to the epithelial proliferation."*

ATTACHMENT OF TISSUES

The connective tissue fibers of the periodontal membrane become attached to the root by cementum forming around their ends, and by the ends of these fibers being calcified. If, for any reason, these fibers become detached, new fibers can form and become attached by the development of a new layer of cementum. The ever-changing relation of the teeth and the various directions from which they receive stress require the formation of layer after layer of new cementum to keep the fibers firmly attached, and to attach new fibers and adjust them to new directions of strain. This process continues throughout life, for it is the last formed, uncalcified cementum that gives the needed strength to the attachment of the fibers.

The epithelial attachment is very different, for it merely adheres to the surface of the tooth, and must have underlying connective tissues to support it as it is only a protective covering for the deeper structures. If the fibers of the periodontal membrane, adjacent to the epithelium, become detached from the cementum the epithelium quickly extends its attachment to replace and protect them. When this epithelial extension becomes long, it generally begins to separate from the tooth at its coronal end.

A report by Kronfeld (11), on the repair of a fractured root, throws valuable light on the attachment and reattachment of dental tissues. The root of this tooth had been fractured in early life, but, as frequently happens, the pulp remained vital and secondary dentin nearly filled the pulp canal in the coronal section. The first act, in making the repair, was the resorption of the fractured surfaces of the dentin on each side of the fracture. Then cementum formed over these roughened and irregular surfaces that had been made ready for a strong form of attachment. The resorption may have been the necessary removal of traumatized and functionally impaired tissue, but it provided a firmer union. There was no resorption of the fractured dentin at two places where epithelium became attached.

When describing the final results in the repair of this fractured root, Kronfeld states (12): "No solid union between the two fragments of the root took place; but there was a fibrous connection that closely resembles, and is the functional equivalent of, the periodontal membrane."

The resorption of the fractured surfaces of dentin, before any cementum was formed on them, explains why it is difficult to get a rapid union of connective tissue to exposed dentin on the surface of a root. The resorption would delay the necessary rapid union.

In a report, describing the treatment of a pulpless tooth that had a large granuloma around the apex of the root, Coolidge (13) furnishes authentic proof that cementum can form over and become firmly attached to dead dentin. The pulp canal of this tooth was treated with antiseptics and filled with guttapercha. A month later, the involved end of the root was resected, and a fixed bridge held it firmly between two adjacent teeth.

Fourteen years after the root end was resected, the tooth was extracted and serial sections were made of the root for histologic studies. The central sections show that on one side of the pulp canal, where resorption had roughened the cut surface, the reparative cementum was so firmly attached to the dentin that it did not separate during sectioning. On the other side of the canal, where there were only two small resorbed spots and the rest of the cut surface was smooth, the cementum separated from the dentin, but it can be seen that the separation was caused by sectioning and is only an artifact. The fibrous tissue, that surrounded the repaired end of the root, was free from infection, and apparently, had functioned in every way like normal periodontal membrane, for there was a layer of newly formed uncalcified cementum on the surface of the reparative cementum.

NUTRITION OF CEMENTUM

The possibility of nutriment from the pulp passing through the dentin into the cementum has long been a controversial question. Many investigators have claimed that the relatively more compact structure

*For brevity, a report on the contributing causes of gingival inflammation and the prevention of it, must be left for a future paper.

of the cemento-dentinal junction forms a barrier to the passage of nutriment. Black (14) supported this generally accepted opinion regarding the nutrition of cementum, by saying: "So far as has ever been demonstrated, it receives no sustenance whatever through the dentin." Later on, however, he wrote that the porosity of these structures permitted a bleaching agent (pyrozone), that was sealed into the pulp canal, to pass quickly through the dentin and cementum and cause an acute inflammation in the periodontal membrane. The apical portion of the pulp canal had been securely sealed with guttapercha. He concluded the report by saying (15): "This operation was repeated, with similar results on two other days within the next two weeks." The cemento-dentinal junction did not prevent the passage of the pyrozone.

A series of photomicrographs of cementum and dentin, prepared by Engs, furnishes histologic evidence that the cemento-dentinal junction is porous and does not prevent the passage of nutriment. The photomicrographs appeared in published papers (16).

While investigating the different possible pathways into and within the tooth with radioactive phosphorus, Wassermann, Blayney, Groetzinger, and De Witt (17), found that the phosphorus can quickly enter the dentin through the cementum and the cemento-dentinal junction. In a brief summary of the methods they employed in their experimental investigation, they state (18): "Measurement was made of the intake of phosphorus by the teeth of adult dogs within 24 hours after an intravenous injection of an aqueous solution of radioactive sodium-phosphate. Both normal teeth and the corresponding teeth on the opposite side of the jaw of which the pulp was either removed or injured were studied." When the pulp was removed, the canal was sealed with a rosin coating and guttapercha, and a metal cap was placed over the enamel. When that work was completed, the only remaining pathway to the dentin was through the cementum and the cemento-dentinal junction.

In a discussion of the investigation, they wrote (19):

> The results obtained by our experiments on pulpless teeth prove definitely that the cemento-dentinal junction is permeable to minerals. Although the pulp is the main source of supply, the intake of minerals by the way of the cementum is not negligible. About one-tenth of the amount of phosphorus taken up by normal teeth in 24 hours enters the pulpless teeth through the cementum. The rate of phosphorus intake was the same in both pulpless teeth and teeth with pulp injured by a slight trauma.

Before the final tests were made to determine the amount of phosphorous that had entered the dentin, the cementum was completely removed from each root.

Investigations by Thomas (20) have furnished convincing evidence that phenol and eosin Y can pass outward through the cementum from the pulp canal, and can also pass inward to the pulp from a prepared cavity on the surface of a tooth. In a summary of the results of his investigations, he states:

> 1. The penetration of phenol through tooth structure has been proved by (a) the positive bromine water test and (b) the use of eosin Y as a tracing agent. 2. *In vitro* experiments showed the penetration from the pulp canal through the dentin and cementum to the surface. 3. *In vitro* and *in vivo* tests illustrate that phenol will penetrate from the base of a cavity to the pulp, following the curvature of the dentinal tubules. 4. Metamorphosed dentin is impermeable to phenol. 5. The effect of phenol on the pulp tissue has been shown by means of photomicrographs of experimental and control cases.

This scientific proof, that various agents can pass into the cementum from the pulp canal, and can also pass into the dentin from the periodontal membrane, makes it rational to believe that nutriment can pass in the same directions, and that the cementum has two sources from which it can receive nutriment. There is no anatomic barrier at the cemento-dentinal junction to prevent it.

TREATMENT OF PERIODONTAL LESIONS

It has long been the hope of the dental profession that scientists would find the way to get an organic union of the connective tissues with the root of the tooth when they have become separated by the development of a periodontal septic pocket. The new research findings have clarified and removed some of the earlier theories that made the union seem impossible. There is also an increasing belief that an effort should always be made to get an organic union of the tissues and avoid the need of removing them by any method.

Orban (21) states: "In many cases one should start with the conservative method and if no satisfactory result is obtained with-

in a reasonable time surgical treatment should be performed. No damage can be done by delaying surgical treatment and often limited improvement by conservative methods is a desirable preparation for surgical procedures." He also states (22): "There are cases where relatively shallow pockets of 2 to 4 mm. depth must be cut away, and in other cases pockets of 4 to 8 mm. disappear by subgingival scaling and curettage, medication, massage, and proper home care."

The writer (23) has stated: "It requires very little knowledge of the tissues, or surgical skill, to remove the separated tissues, but dentistry, like other branches of general surgery, has gone far beyond that procedure. These tissues are so essential that removal can only be thought of when rational and painstaking efforts have failed to reunite them. Removal is the last extremity and not the first act."

Gottlieb (24) states that the tissues can be united in deep pockets, and describes the surgical preparation of the tissues that is necessary to get this result, by saying:

> In such intrabony pockets reattachment can be ventured. All the epithelium in the pocket has to be removed, likewise the superficial layer of the root, being probably infected. Inflamed connective tissue (granulation tissue) must be removed also. The blood clot formed between the tooth and the bone opposite must be protected from being lost. That can be accomplished by connecting the labial with the lingual gingival margin by a suture. If the operation is a success, the blood clot is organized into connective tissue, a new cementum layer is deposited on the root surface, new bone forms opposite the tooth and both become connected by fibers.

In a report on the treatment of ten advanced periodontal cases, Beube (25) has added additional radiographic evidence that new bone can develop in deep periodontal pockets, when the tissues are aided by subgingival surgery. He states: "The cases selected for treatment all presented destruction of alveolar bone and detachment of periodontal membrane extending to the apical third of the root or beyond and in a wide area laterally. Six of the cases had vertical or intrabony pockets, while four showed horizontal destruction of the bone." When describing the postoperative results, he states: "The periodontal pockets as remeasured with pocket millimeter probe were eliminated in all ten cases. Loose teeth were firm in their sockets in all instances after treatment."

"The formation of new alveolar bone was seen in each of the cases treated. The amount of new bone deposited ranged from restoration of one-fourth to as much as two-thirds of the root length newly protected and encased." The report shows that five of the cases had a new bone development of two-thirds the length of the root. Three cases had one-half of the length of the root and only two cases had as little as one-fourth of the length.

It is important to mention that a complete cortical layer had formed over the crest of the new bone in some of the ten cases, as this indicates that the gingival tissues were in a healthy condition. Radiographic studies of the investing tissues of the teeth show that even a mild attack of gingivitis can soon cause a break in the cortical layer at the crest of the alveolar bone. Radiographs of these cases also make it appear certain that the separated tissues had formed the new attachment to the old cementum, for a comparison of the roots, before and after the treatment, shows no noticeable change in either the size or form of the roots. It is evident, therefore, that very little, if any, dentin had been exposed during the treatment.

In earlier published reports of extensive rebuilding of alveolar bone, the radiographs show that care had been taken not to cut deeply into the cementum. The radiographs, in these cases, prove that much of the lost alveolar bone has been replaced by strong new bone. They also show, what appears to be a new periodontal membrane, that could deposit new cementum and support the teeth, but we still lack histologic proof. It is difficult to obtain a tooth, with enough of its attached surrounding structures for a complete histologic examination, after a deep pocket has been eliminated and radiographs prove that there has been an extensive development of new bone.

Leonard (26) says: "It must be assumed that the obliteration of pockets without recession which commonly occurs after effectual conservative treatment is epithelial." The new attachment may only be epithelial when the epithelial lining of the pocket has not been completely removed, for any remaining portion of it can develop very rapidly. Orban (27) explains this development of a deep layer of the epithelium when it is left in the pocket, by saying: "The action of the germinative layer of the

epithelium is necessary to effect the attachment in these cases. The degenerated surface layer of the epithelium in the pocket can not fulfill this function." It should be remembered, however, that a long epithelial attachment on the root is not a strong attachment, for it has a great tendency to separate from the root at its coronal margin. It requires adjacent, firmly attached fibers of the periodontal membrane to support it. A long epithelial attachment would also prevent the development of the badly needed new bone to give firm support to the tooth and there could be no deposition of new cementum where the epithelium becomes attached.

Histologic studies of the repaired fractured root prove, that when need arises, the periodontal membrane can extend and function far beyond the surface of the root where it is normally found, for it extended clear through the fracture and continued to deposit cementum on each fractured surface. In this case, however, the tissues may have been free from chronic infection when the fracture occurred. Therefore, it does not prove that a new periodontal membrane can develop in a surgically prepared periodontal pocket, but the case of the resected end of the root makes it seem possible. In the apical infection case, the chronic infection that surrounded the end of the root and the surgical operation to remove it, had destroyed all traces of the original periodontal membrane, but, in spite of this, a new periodontal membrane developed and continued to deposit new cementum for fourteen years after the operation.

In order to secure an organic reunion of the separated connective tissues with the cementum and the obliteration of the periodontal septic pocket by subgingival surgery, the biologic requirements of each of the tissues must be understood and strictly adhered to. When calculus is present on the root, it should be removed with great care. Then the involved surface of the cementum should be lightly, but accurately, surgically freshened, care being taken not to cut deeply into it at any point. But this is only the first part of the operation. The extension of the epithelium on the surface of the root, beyond the margins of the pocket, and the epithelial covering on the inner surface of the separated, soft tissues must be completely removed. It is not difficult to remove the epithelium from the root at the margins of the pocket. But the removal of the epithelium from the inner surface of the detached soft tissues is a very exacting and difficult surgical operation, for the tissues must be left close to the root to permit rapid healing. Fortunately, the epithelial covering of the tissues in the pocket is frequently very thin and so incomplete that the introduction of a smooth instrument into the pocket will start a slight hemorrhage. Such a case is easily treated.

Orban (28) also states: "Chronic inflammatory conditions are especially slow in response, whereas acute, hyperemic, edematous, easily bleeding gingival tissues will yield quickly."

Chemical agents have been employed to remove the epithelium from periodontal pockets, but it is doubtful if they have entirely removed it. Regarding the use of chemicals for this purpose, the writer (29) has said: "The chemical removal of epithelium is still in the experimental stage. When a chemical agent is employed for this purpose, it should be applied at least a week before the operation for reattachment of the tissues is undertaken. That would permit the inflammation to subside, but not permit the new epithelium to become organized. A caustic agent must never be applied after the calculus has been removed from the root."

While it is absolutely essential to remove the epithelium from the deeper portions of a periodontal pocket in order to get an extensive development of new bone, it is just as essential to remove it right up to the top of the pocket and secure a connective tissue attachment to the root, in order to get a gingival tissue that can perform its functions. When normal, it has a thin, tough, free margin that acts as a buffer to protect the attachment of the tissues to the tooth. The free margin should be very short on the labial and lingual sides of the tooth to permit free cleansing of the sulcus, but it should be longer on each proximal side of the tooth where it joins the gingival margin around the adjacent tooth to form the triangular shaped septal gingiva. Too much importance cannot be attached to the septal gingivae, for they need this triangular form to conduct the food harmlessly over the deeper structures, and to prevent the entrance of food into the interdental spaces from the

labial and lingual sides. A deep sulcus on all sides of a tooth would not permit sufficient cleansing. A sulcus of zero depth around the entire circumference of a tooth is only found where the gingival tissues have been mutilated by surgical procedure or recession and can no longer perform their function.

In 1912, the writer (30) directed attention to three properties of the blood that are essential aids in securing reattachment of the tissues in subgingival surgery, and called the treatment "the blood-clot method." He said:

> This rapid healing by first intention can only be secured by perfect surgery and nature's forces; we must therefore emphasize the value of the blood, which should not be washed out of the wound during any stage of the operation. We require it first for cleansing, second for sterilizing, and third for its reconstructive properties.
>
> This blood is cleansing because of the tendency for liberated blood to coagulate, thus incorporating the loosened particles of deposit in the fibrin. In this way the instruments bring them to the surface much more perfectly than would be possible by washing, since the tissues act like a sponge to hold them. Blood is sterilizing because the presence of micro-organisms in the pockets for considerable time has fortified the blood with anti-bodies to hold these germs in check. The specificity of these anti-bodies is beyond all human imitation, and these do not interfere with the reconstructive properties of the blood, as they are normal to it; they quickly sterilize the wound when we turn the balance of power on their side by perfect surgery. Lastly, the blood is essential to form the union between the freshened gum tissue and the cementum.

In a more recent paper, the writer (31) said:

> When the walls of the pocket are prepared surgically and all particles of calculus are removed fr the wound by the instruments, a blood clot should be allowed to form. The last act should be to start a slight hemorrhage in the bottom of the wound and allow it to coagulate without interference; any further instrumentation would defibrinate it. The blood clot thus formed seals the wound and becomes organized into connective tissue.

The complete sealing of the wound is made possible by the adhesive property of the blood, for it clings firmly to the surgically prepared surface of the root. Then, if loose teeth are properly supported and the gingival tissues are left close to the teeth, all that is needed is to give the tissues surgical rest. The teeth should not be polished until the healing has advanced far enough for the gingival tissues to tolerate it.

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Subgingival Curettage, A Rationale

By HENRY M. GOLDMAN, D.M.D., *Boston, Massachusetts*

IN A REVIEW of the literature concerning the technic of subgingival curettage, there is no unanimity of opinion as to the indications, contraindications, and technic. The purpose of this report is to present a clinical rationale for this method of periodontal therapy.

DIAGNOSIS AND CLASSIFICATION OF POCKETS

It is extremely important to have a thorough knowledge of the size, and the shape of the pocket before therapy is instituted. This necessitates a detailed examination to determine the existing pathology and type of pocket so that the operator may be able to assess the value of the various methods of pocket therapy.

A periodontal pocket may be defined as a space bordered on one side by the tooth and on the other by the crevicular epithelium of the gingiva. Its base is limited by the epithelial attachment. The chief features are the ulceration of the crevicular epithelium and the inflammation of the gingival corium. The pocket is usually filled with debris and calculus.

Periodontal pockets may be classified as either gingival or intrabony. The gingival pocket may be defined as one whose base lies coronal to the alveolar crest (Fig. 1). The intrabony pocket is one whose base is apical to the bone crest, the pocket extending between the tooth surface and the bone (Fig. 2); this latter type may be narrow or broad in nature.

Correlation of periodontal pockets with radiographic changes of the bone structure is important. As a rule, the gingival pocket is associated with a horizontal resorptive process while the intrabony type shows a vertical loss. However, this does not mean that the depth of the pocket may be determined by the x-ray, for often a wide discrepancy exists. It is necessary either to measure the pocket in millimeters and correlate this finding with the radiogram or introduce a radiopaque mass into the pocket before taking an x-ray picture, giving a recording of the relation of the base of the pocket to the bone crest.

REATTACHMENT

Reattachment of the investing tissues of the tooth once a pocket has been formed has been discussed for many years, both sides of the question being supported, for the most part, by clinical observations alone without evidence of laboratory research. Before this most vital problem can be definitely solved much work must be done.

Many periodontists have proved from a clinical aspect that a "reattachment" of the tissue to the tooth is possible. Deep pockets have been shown to be obliterated to such a degree that a probe could not be inserted between the gingiva and the tooth, and the gingiva became pink and firm. However, that this "reattachment" is only a healing of the crevicular epithelium and adaptation to the tooth is claimed by the opposite school. This they say is not reattachment, since only a connective tissue attachment to the tooth is the sole permanent healing. These proponents also state that while reattachment of periodontal membrane fibers from bone to injured or resorbed cementum or dentin surfaces can take place, it has never been shown in periodontal pockets.

It is the writer's belief that true reattachment is not possible in the case of the gingival pocket, in that during healing there is resolution of inflammation of the gingiva and healing of the crevicular epithelium with resultant shrinkage. In this way a healthy gingival sulcus results. In the case of deep gingival pockets, a deepened gingival sulcus will ensue.

However, pocket elimination by means of a true reattachment of the principal fiber apparatus with new formation of cementum and bone is possible in intrabony pockets. This reattachment is possible since shrinkage of the gingiva cannot take place because of the bone in the lateral wall of the pocket. Only the soft tissue above the bone crest can recede. Reattachment of this kind can be compared to the tissue healing seen in apicoectomy.

In the therapy of the intrabony pocket after removal of the crevicular epithelium

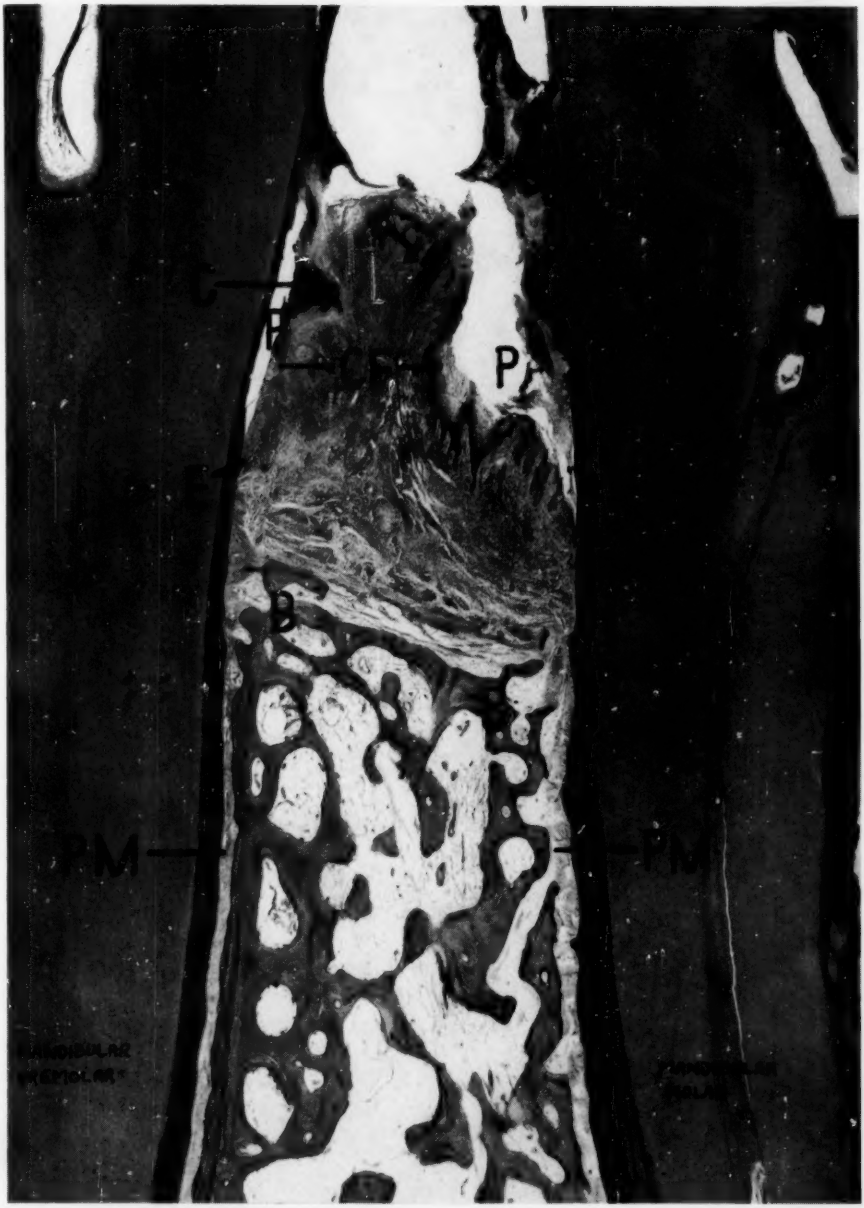

Fig. 1. Photomicrograph showing the interdental tissue between a mandibular second premolar and first molar. Gingival pockets can be seen at P. Calculus and debris fill the pockets. The base of the pockets can be seen at E at which point also the epithelial attachment is placed. The crest of the alveolar bone is seen at B for each tooth. C, calculus; P, pocket; CE, crevicular epithelium; E, epithelial attachment; B, bone; PM, periodontal membrane.

Fig. 2. Photomicrograph illustrating the interdental tissue between a mandibular cuspid and first premolar. A deep intrabony pocket is seen on the mesial of the premolar P, the base of which is at E. Resorption of the alveolar bone has taken place alongside the pocket and the crest of the bone is at B_1. P, pocket; B, bone; CE, crevicular epithelium; E, epithelial attachment; PM, periodontal membrane.

as well as the epithelial attachment and curettage of the infected tooth surface, a blood clot is allowed to form, and become organized into connective tissue. This results in a new point of attachment of the epithelium determined by a race between the organization of periodontal fibers and production of new cementum and the downward growth of epithelium from the gingival margin. Should the epithelium win entirely, then no reattachment is possible.

In the treatment of the intrabony pocket there are many variables which tend to prevent reattachment. First is the removal of the epithelium. If remnants are left behind, these can proliferate, lining the gingival wall; therefore, they must all be carefully removed. Second, the tooth surface must be carefully scaled to remove the infected cementum so that the surface will allow the blood clot to form and attach itself to it. Thus the careful planing of the tooth is of utmost importance. Third, all the infected granulation tissue in the wall of the pocket should be removed to make for a better blood clot. Fourth, the blood clot must be carefully protected so that saliva will not wash it away (or allow it to become secondarily infected.) Therefore, the gingival margin must be covered. Should any of these factors be disregarded, then failure in reattachment will probably result.

THE TREATMENT OF THE GINGIVAL POCKET

In the treatment of the gingival pocket, the method of choice of procedure depends on the periodontal condition. Shallow gingival pockets are best treated by subgingival curettage in that a healthy gingival sulcus will result after resolution of inflammation and healing of the crevicular epithelium. Pockets of moderate depth associated with swollen, edematous, spongy gingivae can also be successfully treated by subgingival curettage. However, similar deep pockets found with long-standing fibrotic inflammatory gingival hyperplasia will not regress to a desired gingival architecture by means of subgingival curettage. This latter condition is best treated by gingivectomy. Deep gingival pockets, however, while they may heal after subgingival curettage, usually result in a deepened gingival sulcus. It is the writer's belief that these are potential pockets and therefore deep gingival pockets are best treated by gingivectomy.

Subgingival curettage consists of cleansing the cementum and the crevicular space of debris and calculus and curetting the gingival wall. This is accomplished by properly designed instruments which are fine enough to pass into the pocket space without distending it. The instruments used in this method are scalers, curettes, and hoes. The operator must develop a technic that will enable him to determine whether he has penetrated the pockets to their fullest depth and whether he has left the cementum smooth. He must know whether he has removed all the calculus, and not merely rounded it off. It requires, therefore, a highly developed sense of touch and considerable experience to master this procedure.

The following technic has been satisfactory to the writer. The necks of the teeth and gums are painted with an antiseptic solution. All deposits attached to the cementum are forcibly, but carefully, removed with a curette or hoe. The ulcerated epithelial lining of the pocket is then removed. The surface of the cementum should be cleansed. The treated area should be protected by a periodontal varnish or an adhesive tin foil. To safeguard the area from injury during regeneration, use of the toothbrush should be prohibited until new tissue has formed which takes place in about five to seven days. If the operation has beeen successful, it will be found that the gingiva is well attached to the tooth clinically, recession having occurred. The tissue will also become pink and of a firm consistency.

It is, of course, to be realized that reattachment of the tissue will not have taken place, but that due to a resolution of inflammation, the tissue will shrink thus reducing the depth of the gingival sulcus. This method can, therefore, be used where you will expect a remodeling of the gingival margin due to this shrinkage; with the healing of the crevicular epithelium the pocket will be obliterated.

Of importance in subgingival curettage is the removal of the crevicular epithelium. The procedure, therefore, is best performed under obtundents or local anesthesia because of the pain attached to this. As shown in the upper illustration of Fig. 3, the first step is the location of the calculus which is attached to the tooth. At "C" the relationship of the calculus in the pocket and the base of the pocket to the alveolar crest in

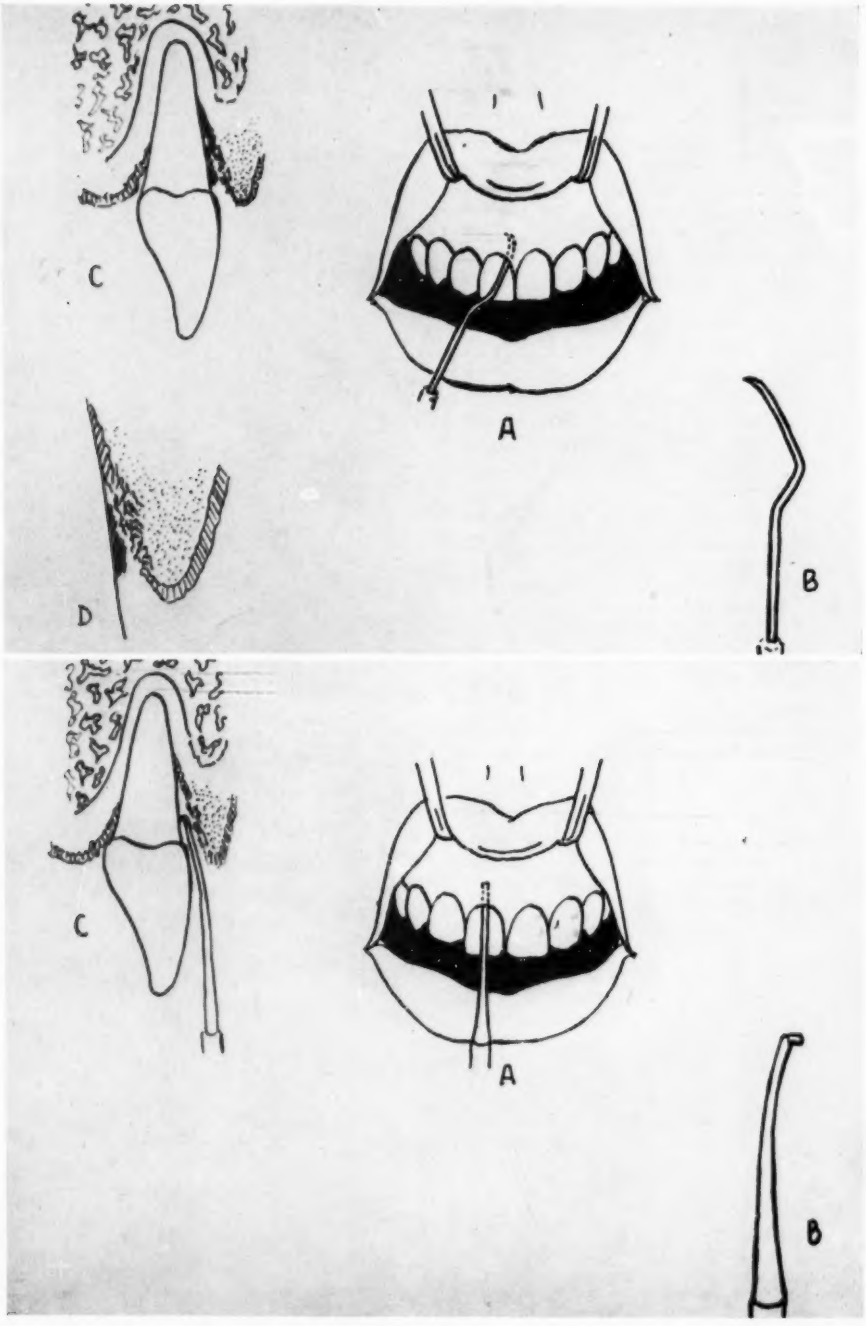

Fig. 3. Technic of subgingival curettage for gingival pockets (See text).

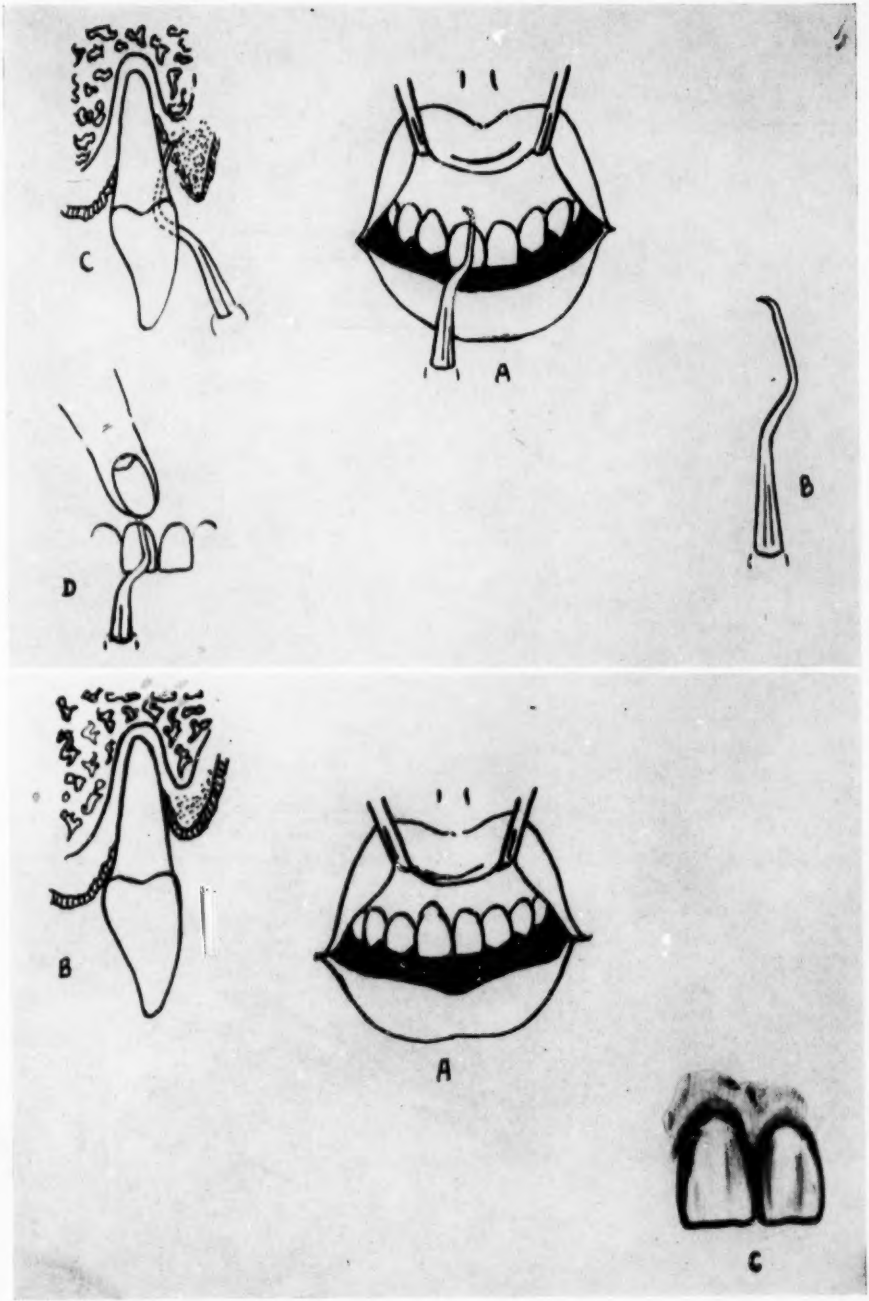

Fig. 4. Technic of subgingival curettage for gingival pockets (See text).

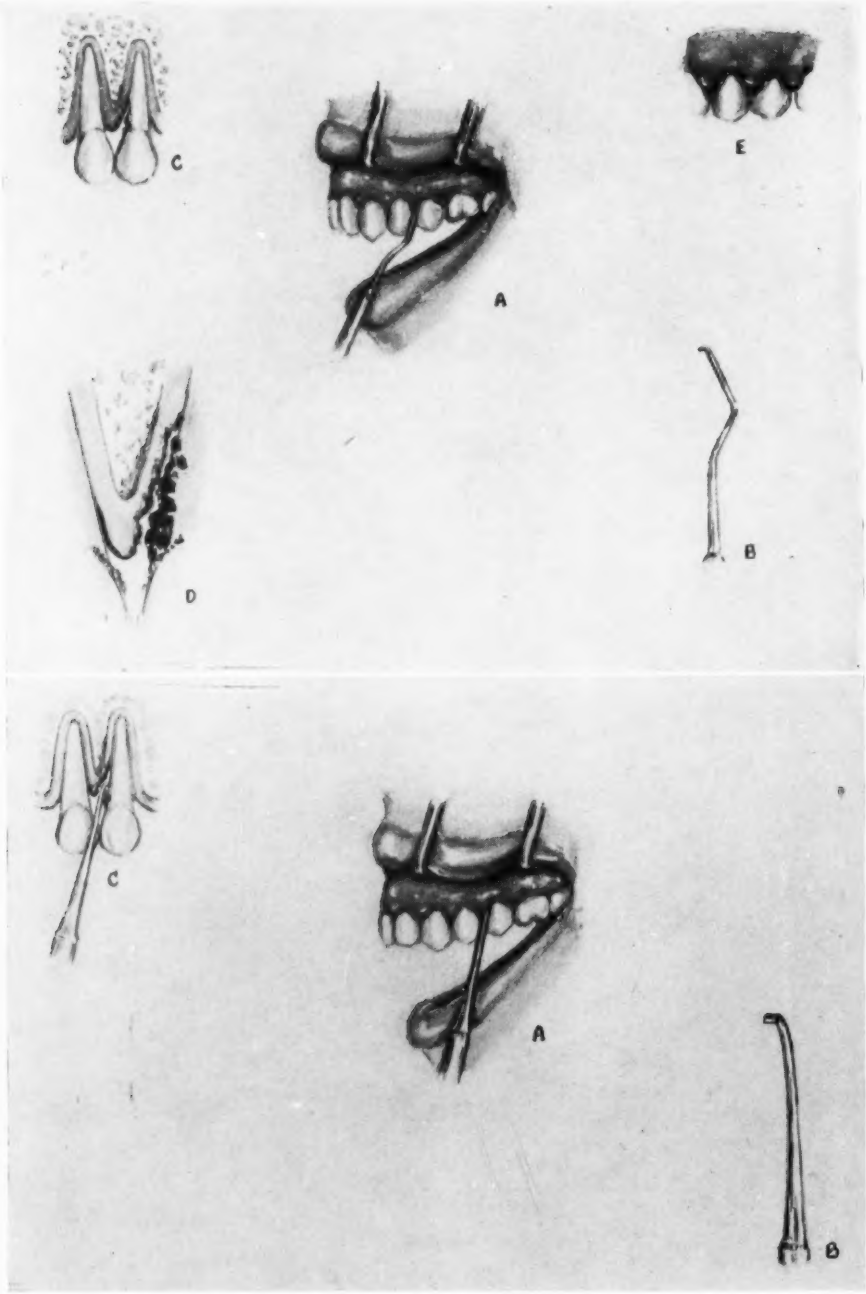

Fig. 5. Technic of subgingival curettage for intrabony pockets (See text).

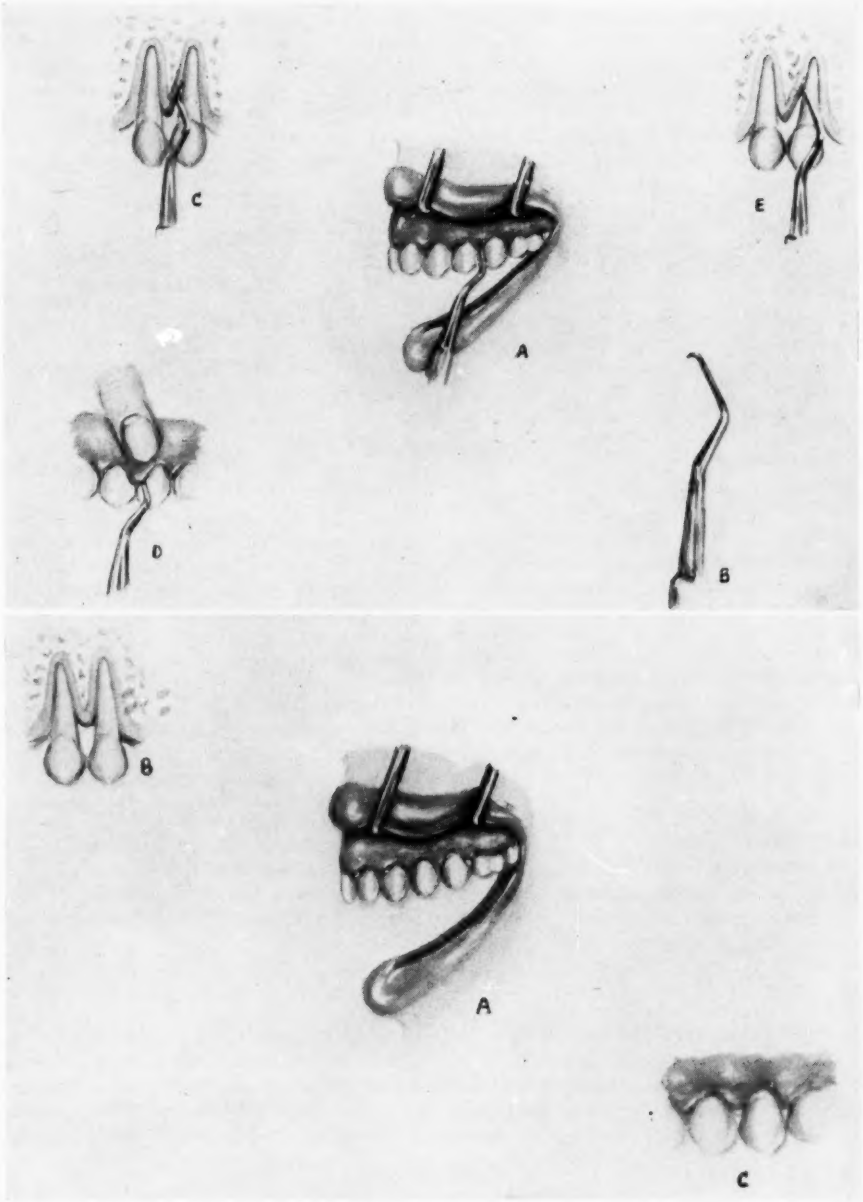

Fig. 6. Technic of subgingival curettage for intrabony pockets (See text).

the gingival pocket can be seen. In the lower picture a hoe is passed into the pocket. The calculus has been removed and the cementum is being smoothened. In Fig. 4 the upper illustration shows the crevicular epithelium being removed. In part "D" of this diagram, the index finger is shown pressing over the pocket on the soft tissue so that the curettage can be made against a firm background. In this procedure where the finger is placed above the pocket on the gingiva, the probing can be felt and it gives an index for the instrumentation. The instrument can be felt while removing the crevicular epithelium. Oftentimes this crevicular epithelium will peel out in a strip; sometimes it has to be curetted out bit by bit. In the lower illustration (Fig. 4) healing has taken place and one can note that recession has also taken place.

THE TREATMENT OF THE INTRABONY POCKET

The therapy of the intrabony pocket presents a difficult problem to the operator in that not only must his technical skill be good but his judgment, based on clinical experience as to the procedure employed, must also be sound. The operator has three choices in the treatment of a pocket in which the base is apical to the alveolar crest and bone is present in the lateral wall of the pocket. First, he can attempt to produce reattachment; second, he can remove the alveolar crest to a level of that of the base of the pocket. The third choice is removal of the affected tooth.

Reattachment is possible in the intrabony pocket as previously discussed. However, the many variables which may prevent successful therapy must be overcome by the technical skill of the operator and his knowledge of the tissue changes present. The more he overcomes these obstacles, the greater percentage of success will he achieve.

Subgingival curettage is the method of choice in that if successful the best clinical result is obtained in that additional support is made for the tooth. It differs in a few essentials from the technic used in gingival pockets. In this procedure it is necessary that all the epithelium lining the pocket together with the epithelial attachment be removed; the tooth surface must be carefully planed. The gingival tissue is carefully readapted to the tooth. Blood between the tooth and bone is allowed to clot and should be protected by suturing the covering of the tissue. If the operation is successful the blood clot organizes into connective tissue and a layer of cementum is formed on the root of the tooth in which periodontal fibres are incorporated; this is also true of the bone. The depth of the sulcus will then end at the point of formation of this new tissue. This method is extremely difficult to perform, taxing the skill of the operator and therefore because of this difficulty failure often results.

Figs. 5 and 6 illustrate the technic of subgingival curettage for the intrabony pocket. It is best performed under local anesthesia. In the upper illustration of Fig. 5, exploration of the intrabony pocket can be seen. In the lower part, the pocket is penetrated with the instrument of choice removing all deposits attached to the cementum; the surface is then carefully planed. As seen in Fig. 6, the epithelial attachment (E) and the ulcerated epithelial lining of the soft-tissue wall (C) are curetted out, and all granulation tissue is removed. The pocket is then flushed with warm saline solution to remove all debris. Blood is allowed to fill the space and the soft tissue is then readapted to the tooth. After healing, the gingiva should be well adapted to the tooth surface.

SUMMARY

Subgingival curettage is an important procedure in periodontal therapy. It is used in both gingival and intrabony pockets, a difference in technic being employed. In the latter, not only is the tooth surface planed, but also the crevicular epithelium and the epithelial attachment are removed.

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In Our Opinion

IS MASSAGE A VALUABLE TREATMENT IN GINGIVITIS AND PERIODONTITIS?

Initial Statement

By HAROLD J. LEONARD, D.D.S., B.A., *New York, N. Y.*

THE conservative local treatment of gingivitis and periodontitis has consisted essentially of removing irritating matter from the root surface, of correcting occlusal traumatic factors, and of stimulating a restoration of circulation in the areas of inflammatory change by massage. The massage was formerly applied by brushing the gingiva at the time the teeth were brushed. In recent years due largely to the teachings of A. E. Webster (*J.A.D.A.* 5:1019, 1918) and I. Hirschfeld (*J. D. Res.* 11:61, 1931) the damage that usually occurs when the gingiva is scrubbed has been recognized. Such scrubbing with a hard bristle brush and an abrasive results in gingival recession, sore gingival margins, and abrasion concavities on crowns and root surfaces. It has been learned that massage is a series of compressions and releases of the congested gingival tissue, and not friction. Most periodontists look upon the stimulating health producing effect of gingival massage as just as essential a part of the treatment as cleansing of the tooth surface.

Recently I have heard several highly scientific members of, or lecturers to, the Academy (T. Rosebury, H. Lyons, D. Ziskin) challenge the idea that gingival massage is desirable. The arguments as I understand them are: (1) that it is contrary to general good medical practice to massage inflamed tissue; (2) that if irritants are removed from the root surface the tissue will heal without massage as shown by the fact that the alveolar and gingival tissues soon heal perfectly after the extraction of a tooth root no matter how severely affected with periodontitis; (3) that the inflamed tissues in periodontitis contain bacteria which are pumped into the general circulation by massage and may localize on heart valves if there is any defect present, to cause subacute bacterial endocarditis.

Gingival massage is so fundamental a factor in restoring health to inflamed gingival and periodontal tissues in my theory and practice that it seems wise to accept the challenge and to open up the subject for examination from all sides.

In my experience inflamed gingival tissue, especially when the inflammation is deeply seated, does not quickly return to health by itself after the root surface is cleansed. Restoration to health of zones of chronic inflammation with their under-oxidation, probable acid reaction, disintegrated connective tissue, permeable capillaries plugged with red blood cells, and lymphatic channels plugged with fibrin, is a slow process. Until the tissue is restored to health, the gingiva hangs loosely around the tooth root and tissue fluid continues to exude into the sulcus thus giving rise to further accumulations of bacterial and fungous slime on the tooth surface. Thus before healing can occur the whole disease cycle is renewed.

By compression and release massage the transudates are forced into the lymph vessels and the red blood cell masses plugging the capillaries are forced into the venules, thus opening the capillaries to arterial blood. The effect is to drain off

acids and the injurious end-products of inflammation and to bring in fresh oxygen and cell nutriment. In a very few days the soreness leaves the tissue, the connective tissue fibers reform and tighten to cause the gingiva closely to hug the tooth root, the lining epithelium of the sulcus heals so that exudate ceases to flow and health supervenes.

The massage may be obtained in most cases by compressing the gingival margins with the *sides* of the toothbrush bristles. Where deep areas of inflammation exist between the roots of teeth it may be impossible to bring compression to the deepest zone with the toothbrush bristles and a rubber point may be more effective. Finger massage in my experience is only valuable in those cases where deep buccal and lingual involvement with overlying bone loss exhibit areas near the root apices which are sore to finger pressure.

Massage in medical practice is mostly a matter of stimulating a circulatory flow in muscles and other connective tissues by gentle stroking of the skin. Deep vigorous manipulation of inflamed joints and muscles is no longer considered good practice. Acute inflammations are not massaged, but when the acute stage has passed, fibrositis in its many forms is generally treated by gentle massage to stimulate the elimination of inflammatory end-products and to bring in fresh blood. The massage may consist of a gentle stroking of the skin which causes a temporary hyperemia in skin and subcutaneous tissues by its nervous reflex effect.

The gingiva does not respond as readily as the skin elsewhere to mild stimuli. Applications of cold, mild heat, or gentle stroking are not followed by temporary suffusion. It is only when considerable pressures are applied against the gingival margin that increased blood flow can be seen, following in a few seconds as a mild reddening of pink gingiva or as a change in the direction of red when a purplish hue was present.

It is not necessary that the pressures against the gingival margin be so heavy as to cause pain. I. Hirschfeld finds that a three-row *medium* hard brush will give sufficient pressure to accomplish the purpose of stimulation without so much danger of abrading the gingiva as with a hard bristle brush. The pressure should be sufficient to compress gently the congested tissue to its depths. More than this is unnecessary. The massage which is thus given acts as a stimulus to a vigorous blood flow through the tissue that should be present as the result of the action and reaction of coarse food on teeth and gingiva, but is generally absent on a modern diet.

The idea that massage may be a cause of bacteremia leading to possible subacute bacterial endocarditis is simply impractical. Bartels (*Am. J. Ortho. & Or. Surg.* 26:366, 1940) has shown that transient bacteremia occurs not only from extracting infected teeth, but also from periodontal and prophylactic instrumentation, even from chewing food when the teeth are loose or gingiva inflamed. Very evidently something besides transient bacteremia is involved in those infrequent cases where endocarditis results. It would seem that the sooner the gingival tissues were brought back to health the less the danger of systemic effects resulting from gingival inflammation.

I shall be much interested to hear the contrary side of the case and to learn why or how the experience of others, as to the value of gingival massage, comes to differ so much from mine.

Discussion

LILLIAN BARKANN, D.D.S.
New York, N. Y.

The interpolation of a few modifying phrases in the original question under discussion should eliminate all negative arguments: is massage—in the correct place, at the correct time, in the correct manner, with the correct instruments—a valuable treatment in gingivitis and periodontitis? My answer, under such circumstances, would be an unqualified "yes". I have never treated a case without massaging the gums, and also training the patient to do likewise. Although it is true that I have occasionally seen regions which have been damaged by incorrect brushing, I think it pertinent to draw the line between "scrubbing" and "massaging".

The reasons for massage, are well summarized in the "Initial Statement", in which reference is made to the re-establishment of circulation and tightening of connective tissue fibers. Furthermore, correct massage can help approximate the gingiva to the underlying structures, and can also influence the final contour thereof for cosmetic effect.

The value of toothbrush massage was first demonstrated to me almost thirty years ago by Dr. Paul R. Stillman, and somewhat later by Dr. W. J. Charters. My experience has since convinced me of the correctness of the fundamental principle they taught, that the hygiene of every mouth, healthy or infected, requires stimulation which is not supplied by the foods we ordinarily eat, and that especial attention must be given to the gingivae and interproximal papillae.

The importance of massage can be frequently demonstrated where it is conspicuous by its absence. Where massaging (by the patient) is simple and the areas easily accessible after treatment, the gingiva becomes firm and the pocket zero. However, in the same mouth, where areas are comparatively inaccessible and require some effort on the part of the patient, or where they are routinely missed, for example during the habitual changing of the direction of the brush from right to left or from left to right, not only do the areas not return to health, but the inflammatory process usually recurs.

I agree with Drs. Rosebury, Lyons, and Ziskin, that it is contrary to general medical practice to massage an inflamed tissue, but I think that my qualifying the original question negates their use of this argument. It is my custom to commence the treatment of a case of periodontitis by superficial curettage, after which small areas are treated, individually, as the conditions indicate; but massage is not introduced until the acute inflammatory process has subsided. For cleanliness during these earlier periods, I depend upon a peroxide mouth-wash, plus the customarily casual brushings by the patient. (I always stress the importance of keeping the brush clean.) The sensitivity of any inflamed area is invariably sufficient to prevent its being touched by the patient's brush.

Not mentioned among the three basic arguments against massage, is the danger of shrinking the overlying tissue, thus confining the products of inflammation within the pocket. This is another reason for postponing massage until after curettage. But postponement should not be amplified into omission.

Gradually, massage is introduced, each patient having a brush on file in our office. As the case progresses, the massage technique is explained to the patient, and his dexterity and ability to carry out instructions in home care are checked during subsequent visits, thus enabling me to observe the response to this part of the treatment.

The importance of selecting the correct toothbrush and dentifrice, as well as the technique of their use, cannot be over-emphasized. Granting that in some mouths injury will be noted on the cemento-enamel areas of certain teeth, such damage would probably have been prevented had the patient been instructed previously in the correct use of his brush, as he will be during periodontal treatment.

The comparison of healing after periodontia and after exodontia is not valid; the conditions are hardly comparable, as the tooth remains in the socket during and after periodontal treatment.

Although I can understand the possible danger of bacteria from inflamed tissues being pumped into the general circulation, even to the extent of causing subacute bacterial endocarditis, I feel confident that this risk is completely eliminated by my previous statement, in which I made it quite clear

that the tissues are never massaged while inflamed.

In my opinion, which can be borne out by clinical experience, massage is most valuable in the treatment of gingivitis and periodontitis. I do not think that its infrequent incorrect use warrants the elimination of this valuable adjunct from our technique.

FRANK E. BEUBE, D.D.S.
New York, N. Y.

Massage is certainly contraindicated for inflammations such as periodontal abscess, necrotizing ulcerative gingivitis, desquamative gingivitis, purulent periodontitis, gingivitis due to blood dyscrasias, and other similar periodontal diseases. Massaging of these conditions could result in painful sequelae, spread of the lesions, transient bacteremia, or it might simply be ineffectual. However, the introduction of toothbrush massage at the proper moment after other essential treatment has been instituted for the above lesions, seems to be a necessary aid to finally achieve normal gingival tone and color. If this statement was clinically unfounded, then necrotizing ulcerative gingivitis would be completely cured by drugs and scaling of the teeth only. This does not occur. There is residual inflammation if the patient is not instructed in gingival massage. Nor does marginal gingivitis due to the lack of function and hygiene respond to only scaling of the teeth and the removal of plaques. To support this statement clinical tests were undertaken, which will be described briefly.

Patients were selected with marginal gingivitis, apparently due only to poor home care and local accumulated irritants. Teeth on one side of the mouth were scaled daily (the control side) for several weeks without the benefit of correct toothbrush technique. (The patient's previous method of brushing was maintained on this side.) The teeth on the other side were scaled and, in addition, the teeth and gingival tissue were cleaned and massaged with a toothbrush technique as taught to the patient. The marginal gingival tissue on the control side still showed some inflammation at the end of the clinical test period. The opposite side was free of gingivitis. Further evidence that a correct technique for massaging and cleaning with the toothbrush is essential has been observed by clinical observations on patients, whose gingival tissues became normal after all treatment was completed including use of massage, but whose tissues would become inflamed again when the patients discarded the massaging technique, either by request or of their own volition and started to apply a former method of using the toothbrush.

As mentioned earlier, to immediately introduce a massaging and cleaning technique, before removing the causes of inflammation, may invite hazards such as transient bacteremia. Since it is yet unknown what this bacteremia may do to the various tissues and organs of the body, it seems good judgment to eliminate purulent conditions, and infections, before teaching patients the correct use of the toothbrush. The postponement of this technique for a number of visits does not hamper its ultimate effectiveness, as an adjunctive treatment for these lesions.

If it is meant by deeply seated inflammation, the presence of granulomatous tissue found in the periodontal pockets of periodontitis, then root surface scaling by itself (excluding soft tissue curettement) is not adequate to remove this inflammatory process, nor will massaging with the toothbrush reach these areas or have much influence in eradicating this tissue. To remove this type of inflammation it would be necessary to free the area of the granulomatous tissue by curettement or by other surgical means. If this were done, concern for reaching inflammation, deep in the tissue, by massage would not be essential. If the reference to deeply seated inflammation includes the type which extends from the marginal gingiva into the alveolar and areolar gingiva, as noted by visual examination and evidenced by redness or cyanosis, and is of local origin, such as subgingival calculus, traumatogenic occlusion, etc., then this inflammation will disappear after the irritating factors are removed. This will occur without benefit of massage. However, if massaging is not taught to the patient, the marginal gingiva, which had improved by what was done, will not remain in health, because of the collections of materia alba along the gingival margins. The alveolar and areolar gingiva are not so affected because similar accumulations do not occur on these tissues.

The extent of our knowledge of the value of gingival massage, through experimental evidence, is meager. However, clinical and some experimental findings seem to point to

the direction that massaging gingival tissue is a necessary adjunct to dental practice.

M. H. GARVIN, D.D.S.

Winnipeg, Canada

It is a privilege to be able to comment on Dr. Leonard's thesis. I must belong to the majority, since he states that, "most periodontists look upon the stimulating health producing effect of gingival massage as just as essential a part of the treatment as cleansing of the tooth surface."

When the pathosis has been removed, either by conservative scaling or by gingivectomy, which latter procedure I follow in nearly all cases other than in the simpler types of gingivitis, stimulation becomes the key to a favourable prognosis.

Tooth brushing is important and I, too, favour a medium bristle rather than a hard one. However, in my practice, tooth brushing takes second place to interdental stimulation.

A rubber point is suggested for this purpose which is ideal for those cases in which the interdental space is large enough to permit of its easy entrance. However, in those cases where this space is not large, I find that a wooden tooth-pick is of much greater practical value. It is moved back and forth between the teeth and against the gum. This procedure helps keep the interdental spaces clean as no amount of tooth brushing will do; it stirs up the circulation and thickens the epithelium, making it more resistant to infection.

In the treatment of thousands of cases I have never heard of a case of subacute bacterial endocarditis developing as a result of treatment, but have seen scores of patients greatly improved in health by the treatment outlined.

MAX GIESECKE, D.D.S.

Denver, Colorado

I will agree with anyone who maintains that *scrubbing* the gums with a stiff brush is bad, also I agree that massaging the gingivae which are in an *acute* stage of inflammation should be avoided, but I do not agree that gingivae should not be massaged with a stiff brush or a rubber interdental stimulator after the irritants have been removed and the acute inflammation has subsided.

When I am told by patients that they cannot use a stiff brush without "hurting their gums" I know that they are brushing improperly.

After normal circulation has been re-established it is up to the individual to maintain it. I know of no better way to do so than by massage brushing and the use of the rubber or soft wood interdental stimulators.

Patients must be taught how to keep the mouth clean and the gingivae massaged. To bring this about, I show the use of a stiff brush on an Odontotype. Next, I use a new extra hard brush, two rows with six tufts each, and demonstrate in the patient's mouth in order that he can get the feel of the bristles and the amount of pressure used. Then, I give the patient the brush and have him demonstrate in his mouth so that he understands what is needed.

To be sure that he knows how to use a rubber stimulator, it is also demonstrated in the mouth. The patient thus gets the feel of the pressure used.

I stress that under no circumstances should the *ends* of the bristles be used on the soft tissues, but that the sides of the bristles should be swept or dragged over the tissue with some pressure to stimulate the circulation.

Until the individual has mastered the technic, he is instructed to use slow deliberate strokes even though it may take a week or so before he can speed up.

I have used the massage method and rubber stimulation for over twenty-five years, and when properly mastered by the patient I have noted no ill effects. Rather, there is a decided improvement in the tissue tone in the mouths of those who use the stimulators and follow the proper brushing technic regularly.

WILLIAM M. GREENHUT, B.S., D.D.S.

New York, N. Y.

It is my opinion that massage is a valuable adjunct to the treatment of gingivitis and other forms of periodontal disease. I cannot understand the arguments of T. Rosebury, H. Lyons, and D. Ziskin in the "Initial Statement". They claim that massage will pump bacteria into the general circulation, and yet they agree to the forceful insertion of instruments for the removal of irritants from the root surface.

It is generally agreed, and accepted good medical practice that when the cause of a disease is considered to be of a complex nature, an attempt should be made to eliminate as many of these etiologic factors as possible. Leonard says the causes consist essentially of irritating materials on the root surfaces, traumatic occlusion, and impaired circulation. These are eliminated with conservative and local treatment. There are other causes such as nutritional deficiencies and disbalance, systemic disorders (nephritis, diabetes, syphilis, etc.) blood dyscrasias, endocrine dysfunctions, and psychogenic factors. S. C. Miller organizes all these causes under the headings of dysfunctional, irritational, and systemic.

Many practitioners neglect a valuable asset in the treatment of periodontal disease, if they do not stress massage. I agree with Leonard when he states that gingival massage is a fundamental factor in restoring health to gingival and periodontal tissues. The employment of the proper method of massage with alkalized salt water brush dip, definitely aids recovery. It creates a method of home treatment that will bring about stimulation in the form of massage, and also the formation of a protective horny cuticle. The massage brings new blood and its accompanying nutrition to the areas which have become stagnant because of disease. Massage promotes health and increases the future resistance to disease.

In recent years there have been changes in the procedure of massage from the scrubbing techniques to those developed by W. J. Charters and Paul R. Stillman. Various scientific forms of brushing, with their indications and contraindications can be found in such texts and articles as: S. Sorrin and S. C. Miller (MacMillan Co. 1928); I. Hirschfeld (Dental Items of Interest Publishing Co. 1939); W. J. Charters (*J.A.D.A.* 6:38-41. Jar. 1928); P. R. Stillman (*J.A.D.A.* 15:1077-1080. June, 1928); and S. C. Miller (Blakiston Co. 2nd Edition 1943); and J. Blass and I. Tulkin (J. B. Lippincott 1947).

A contraindication for tooth brushing may be present in the acute phase of necrotic gingivitis. The tissues are tender and pressure will cause pain. However, brushing should be instituted in the treatment of disease as soon as possible and careful brushing by the operator is an asset. Another contraindication is the paradontal abscess. When the paradontal abscess is of the acute inflammatory type, I believe it fits into the (3rd) statement on the desirability of massage:— ". . . that the inflamed tissues in periodontitis contain bacteria which are pumped into the general circulation by massage and may localize on heart valves if there is any defect present, to cause subacute bacterial endocarditis." In these cases, I believe it wise to create drainage by light curettage through the orifice of the pocket and instruct the patient to rinse with hot saline solution for the osmotic effect and also to localize the infection. At the next visit, I usually find the paradontal abscess in a chronic state and I then am able to curette the area more thoroughly and instruct the patient to brush in this region.

In conclusion, the benefits of massage are: a better gingival circulation, the periodontium is stimulated, there is a removal of food debris with its accompanying diminutions of bacteria and mucinous plaques and the epithelium around the tooth becomes firmer which narrows the orifice to the pocket.

RAYMOND E. JOHNSON, D.D.S.
St. Paul, Minnesota

The discussion of the value of massage in the treatment of gingivitis and periodontitis is very timely. I am in full agreement with our discussion Leader that massage is a fundamental factor in restoring health to inflamed gingival and periodontal tissues. Of all the factors to be considered in the periodontal therapy of gingivitis and periodontitis, toothbrushing and massage would be the last I could eliminate in order to maintain health in the supporting tissues.

The teachings of Hirschfeld about the abuse of the gingival tissues by the use of a hard bristle toothbrush are very important in this discussion. If in all cases patients are taught tooth brushing and massage with a three-row, soft toothbrush until all inflammation and tenderness disappear, it will be surprising to see how quickly the tissues respond to this gentle stimulation and with no danger of abrading the gingiva. As soon as the tissues are firm and have been restored to a healthy pink color, a medium bristle brush should be advocated.

As to the possibility of massage causing subacute bacterial endocarditis more research needs to be done to prove this conclusively.

At the present time, work is being done in our Dental School by one of the graduate students in coöperation with Dr. B. J. Clawson in the Medical School, who has been very much interested in subacute bacterial endocarditis and rheumatic heart. Samples of blood are taken from periodontal patients before any examination or probing is done, also several times during the course of treatment, and some time after completion. It is hoped that together with the work already done we may soon be more enlightened on this particular problem.

WALTER LEABO, D.D.S.
Shreveport, Louisiana

The subject matter in this "Initial Statement" brings to us a phase of the problem involved in the common practice of gingival massage that is startling to say the least. As presented the arguments against gingival massage are quite intriguing, and it is not hard to see that doubt could readily be created in the minds of many interested in periodontia relative to this important procedure. In view of this, it is incumbent upon us to evaluate as carefully as possible the arguments for and against gingival massage, weighing them as far as possible in the scales of experience and practicality pending such time as there may develop more definite facts.

The argument is presented in a most detailed manner for gingival massage as it has been practiced, and the following discussion is an effort to express one reaction to the problem.

The gingival areas are undoubtedly made up of specialized tissues, accustomed to a series of compressions and releases encountered in the process of mastication, and maintaining their function and health best when this compression is systematically delivered. Practically all clinical observers are convinced of the immediate and lasting improvement in gingival tissues when given artificially the exercise they are usually denied because of lack of function.

Since the objection offered to gingival massage would seem to be more or less theoretical, it might be projected to the point where the compression of the slightest area of inflammation in any portion of the marginal tissues would be considered dangerous even in the ordinary function of mastication. In fact there are few mouths which do not have some areas in the many inches of gingival tissue where inflammation in some degree does not exist. Of course, the idea of pumping bacteria into the blood stream by massage could have merit, but considering the tremendous prevalance of gingival inflammatory tissues, it would seem that since the advent of the practice of massage technique there would have been such evidence of secondary involvements as to have attracted more than passing attention.

In the treatment of periodontal lesions many operators begin immediately the curettage of the involved and infected areas. This accomplishes the elimination of irritants, considerable infection, while the profuse hemorrhaging accompanying this operation doubtless empties the capillaries of a large part of the congested blood and allows fresh arterial blood, well armed, to take its place. It is logical to assume that from there on the daily renewal of this arterial blood by massage where the capillaries are still not able to accomplish this for themselves, would greatly lessen the chances of infection locally as well as otherwise.

Considering the arguments quoted in the "Initial Statement" against gingival massage it might be possible to answer each as enumerated:

(1) Dental practice does not advocate the massage of acute pericemental infections.

(2) The comparison between a chronically infected periodontal area with the tooth in place is not analogous to the situation existing in the tissues after the removal of the tooth.

(3) Granting that massage might force bacteria into the general circulation, mastication has undoubtedly already been doing the same; therefore the quicker stasis is eliminated and good circulation restored the less the danger. If the heart valves or other tissues have not already become involved, it is unlikely to occur in the process of instrumentation and massage to restore circulation.

If the idea or theory that the compression of inflammatory gingival tissue results in the pumping of organisms into the circulation with the possibilities of bacterial endocarditis is correct, it would seem reasonable to expect the process to be operative under all

conditions. Thus in the operation of subgingival curettage, which is quite generally used in the treatment of many if not most periodontal diseases, a series of compressions and releases upon the gingival tissues is exerted, and it might be dangerous or even disastrous to attempt instrumentation of diseased gingival tissues or subgingival areas. This is difficult to accept. Until there is some very factual evidence contrary to the present practice of gingival massage, it seems likely to continue to occupy its important place in restoring and maintaining health to periodontal tissues.

VIRGIL LOEB, M.D., D.D.S.
St. Louis, Missouri

The author in his "Initial Statement," attempts to show that massage of the gingival tissue is a necessary adjunct to periodontal treatment and even states that "most periodontists look on the stimulating health producing effect of the massage as just as essential a part of the treatment as cleansing of the tooth surface." With this statement, I disagree. While I concede that gentle massage of the gingiva, properly administered, may be helpful, and probably can do no harm, the harm comes from massage not given under the direct observation of the periodontist. Patients frequently, with the very best intentions, attempt to carry out at home instructions given in the dental office, but do so unsuccessfully and even harmfully.

Dr. Leonard has mentioned some of the unfortunate results of massage, and it is my observation that these occur much more often than do the benefits that are expected. As a matter of fact, if a patient follows the instructions given him as to the proper use of the toothbrush, a certain amount, and usually a sufficient amount, of gingival massage is forthcoming.

We have always the question of transient bacteremia to be considered, and, this may occur from periodontal and prophylactic instrumentation alone. How injurious this may be, systemically, is not so easy to determine, and I do not think anyone has the right to say, "the idea that massage may be a cause of bacteremia leading to possible sub-acute bacterial endocarditis is simply impractical". Certainly other factors besides a simple transient bacteremia must exist, but damaged heart valves might be invaded by organisms in the blood stream which are released from about infected teeth during the process of massage, and, if such organisms are of a specifically virulent type, a sub-acute bacterial endocarditis may result. Such conditions have resulted from the removal of what appeared to be an innocent tooth so why could not this occur when organisms are forced into the circulation by the massage of inflamed and infected areas?

Dr. Leonard has given most of the arguments for and against the use of gingival massage. To me the arguments against it are more convincing than those for it, besides which the results obtained in my own practice, over a period of many, many years, seem to justify the claim that massage is not "essential" in the treatment of gingivitis and periodontitis.

G. R. LUNDQUIST, D.D.S.
Chicago, Illinois

To answer the points raised by (T. Rosebury, H. Lyons, D. Ziskin) that it is contrary to general good medical practice to massage inflamed tissues, I should like to quote Drinker & Yoffey (Drinker, C. K., and Yoffey, J. M.: *Lymphatics, Lymph, and Lymphoid Tissue.* Harvard University Press.) to the effect that, "If lymph flow is to be promoted, a combination of massage, passive movement, and heat will be maximally effective." Zinc chloride packs used as described in "Periodontal Treatment"—Lundquist (Lundquist, G. R.: "Periodontal Involvement and Its Management." *J.A.D.A.* Mar. 1945.) or Zinc Chloride Pack as used at Northwestern University Dental School in accompanying statement distributed to our Junior Class answers this question, I believe.

(2) Their statement that if irritants are removed from root surfaces, the tissue will heal without massage is correct as far as it goes. This implies that further ingress of microörganisms ceases as the epithelium heals or becomes intact. The fluids and cellular elements which are left *in situ*, will have to be moved out of tissues in the direction of lymph drainage by zinc chloride packs, interdental stimulation, or other procedures. The statement that gingival tissues soon heal perfectly after the extraction of a tooth root, no matter how severely affected with periodontitis, has nothing in common with the above question. In the latter case, we are

dealing with pocket elimination, the hard tissue side, and a reconstituted healing process related thereto.

(3) Judicious massage like bandaging is done after the surface factors related to infection are dealt with. Hence, scale first—if a *transient* bacteremia occurs—it is just that. Even this is doubtful if Menkin's theory of lymphatic block has any merit. The massage is practiced after the so-called, *transient* bacteremia occurs, so that none of the fears related to a good practice of restoring gingival health need arise.

T. Rosebury, H. Lyons and D. Ziskin I believe are perhaps averse to massage immediately following scaling, especially when dealing with acute inflammatory involvements of the gingivae. With this I agree and for this period only.

HARRY LYONS, D.D.S.

Richmond, Virginia

The question of massage and its therapeutic merits in periodontal therapy is a *question* in the true sense of the term. It is supported by the weight of a great body of dental literature bearing the *testimony* of many dentists. This testimony is probably accepted as *fact* by the majority of dentists. Though statistical studies on this point are not available, the writer is willing to concede the point in this discussion. No doubt, the advertisements of certain dentifrices have contributed much to this point of view now held by so many dentists. The *fact* in the case is that the *question* has not been answered by *scientific evidence*. Before undertaking a discussion of the question itself, it appears important to clarify the difference between *testimony* and *scientific evidence* as these are related to this and other questions in Dentistry and Medicine generally.

Scientific evidence is *indisputable proof* established by scientific procedure. *Testimony* as used here is *statement* of *opinion*. These statements indicate how tremendous is the difference between the two.

Testimony on the part of many people, as is admitted in the instance under discussion, establishes a weight of opinion. In this particular instance, we may be dealing with weight of the majority's opinion. However, majority opinion does not necessarily constitute fact. The majority opinion may not even be the best opinion. To uphold this point of view is to contend that the *superior wisdom* always rests with the *many* rather than with the intellectual *few*. This is something to be divinely wished, but unfortunately is not yet a reality.

The majority opinion evidences popularity at the moment, but not the scientific validity of the item under consideration.

Leeching as a therapeutic procedure was, at one time, supported by the weight of majority opinion. Its alleged therapeutic value was never established by scientific evidence. Massage as a periodontal therapeutic method is now probably supported by the weight of majority opinion. Its therapeutic value is also yet to be validated by scientific evidence. Its merits must still be designated as "alleged".

The alleged merits of massage in periodontal therapy have long been a matter of concern to many interested in rationalizing their teachings in the field of dental therapy. The problem has also been of concern to several agencies of the American Dental Association which are confronted with the task of evaluating certain advertising claims. The Federal Trade Commission is currently dealing with the problem in connection with actions against certain firms engaged in the manufacture and sale of dentifrices. The difficulties encountered in connection with the above are not due to a lack of testimony in and out of dental literature. Verbal opinion, textbooks, and articles in the periodical literature furnish a great volume of this. The striking fact is that there is no acceptable *scientific evidence* on the subject. The burden of proof must necessarily rest on those who are promoting the technic and claims.

The following quotation from a report appearing in the *Journal of the American Dental Association*, (33:768, June 1, 1946) is pertinently related to this discussion:

> Dental literature contains many conflicting and often unscientific statements about the effects of brushing, massage and chewing of resistant or resilient substances upon the gingivae, periodontal membrane, alveolar bone and oral mucosa, in the opinion of a group consisting of periodontists, research workers, an oral surgeon and an orthodontist.
>
> At a conference held April 4, in the Central Office of the American Dental Association, the group urged that further research be conducted to prevent spread of such statements, which, it charged, are based on personal opinion rather than on scientific facts.
>
> As a guide in preparing and evaluating dental health information for the public, the conference

framed a six-point recommendation for submission to the Association's Council on Dental Therapeutics, Council on Dental Health and Bureau of Public Relations.

The recommendations of this group are fully in harmony with the contentions of this discussion.

I disagree wholeheartedly with Dr. Leonard's contention in his "Initial Statement" that the restoration of good circulation in the periodontium depends to a great extent on massage. With the exception of correcting occlusal traumatic factors, he fails to make reference to the establishment of good function on an over-all basis. This includes many things which need not be enumerated here. Circulatory stimulation can best be obtained and maintained by good function. Massage is, at best, a poor substitute for good functional stimulation. Without the latter, good health cannot be induced or maintained. The establishment of good function, the removal of irritants and other phases of adequate treatment of the involved sulci, and the maintenance of good hygiene constitute the *sine quo non* of local periodontal therapy. It is yet to be shown that rubbing, scrubbing, stroking, squeezing, vibrating, or compressing and releasing the gingivae contribute to the rate or extent of healing. There are, to my knowledge, no reports on this based on studies utilizing scientific controls or other acceptable scientific methods. On the other hand, it can be shown that spectacular results are obtainable without these adjunctive procedures. The contention that periodontal healing cannot be satisfactorily induced without so-called massage is contrary to the facts.

Dr. Leonard states that in his experience ". . . inflamed gingival tissue, especially when the inflammation is deep seated, does not quickly return to health by itself after the root surface is cleansed". Of course, it does not! Since when does cleansing the root surface constitute adequate treatment for deep seated gingival disease? Deep seated gingival inflammation often leads to destruction of the transeptal and alveolar crest groups of principal fibers of the periodontal membrane. This phase of gingival disease accounts for an alteration in the functional relationships of teeth and dysfunction then prevails. Unless this is corrected in a fully synchronized treatment program, it appears unreasonable to expect satisfactory results. Functional abrasion may, in due time, correct limited degrees of dysfunction in some cases and complete resolution of the disorder may then follow. However, unless or until tissues are afforded the effects of good functional stimulation, response to limited or incomplete treatment will not lead to satisfactory results, with or without massage. These are statements of therapeutic principles of axiomatic caliber.

Dr. Leonard describes the changes allegedly induced in inflamed tissues by compression and release massage. I fear that he is indulging in wishful thinking, when he attributes to massage the credit for the difference between failure and success in the treatment of inflammatory periodontal disease. The resolution of periodontal inflammation does not depend on massage. Such contentions need to be supported by scientific evidence based on controlled comparisons and observations. On the contrary, clinical experiences indicate to many careful observers that diseased periodontal structures, given a full-rounded and adequate treatment program, respond better when not subjected to the influences of rubbing, compression and release, or any other type of so-called massage. These are not natural influences for the gingivae, as will be discussed in detail later.

The contention that massage is indicated to supply the stimulation which the gingivae are alleged to miss from our modern diet rests, in part, on the erroneous concept that the gingivae are scoured by food during mastication. The normal contact relationships of adjoining teeth, their convex contours and other structural details such as the cingula of the incisors, the inclinations of teeth in their alignments, and other anatomy details all function to *protect* the gingivae against scouring and pressure impaction of food in mastication. When details of these structural arrangements deviate from the normal, gingival disease follows as a result of tissue insults incident to the mastication of food and its action on the gingivae. Anyone familiar with the details of dental anatomy and the problems in operative dentistry, crown and bridgework, and denture prosthesis related to these structural details, will recognize this contention as a self-evident fact. Nature obviously intends the gingivae to be protected and sheltered from food traction and pressure. To violate this principle and claim thera-

peutic merit for it is untenable from a scientific point of view.

In many instances of periodontal disease, chronic infections are an important feature. The massage of chronically infected tissues is contrary to presently accepted concepts of good medical practice.

Postoperative massage following subgingival curettage may be compared logically to the massage of an infected finger from which a splinter has just been removed. I question that authoritative medical opinion would condone that practice.

With regard to transient bacteremia, no one is yet in a position to accurately evaluate this phenomenon, nor is the full story of the causation of subacute bacterial endocarditis known. However, since a bacteremia appears to be an essential feature in the causation of this type of endocarditis, simple logic indicates that the deliberate and indiscriminate disregard of the transient bacteremia incident to the massage of infected structures does not take into account patient welfare to the fullest degree.

In addition to the contraindications already noted, one must also note such periodontal diseases as desquamative gingivitis and so-called pregnancy gingivitis, in both of which types of gingival disease hormonal disorders play causative roles.

The possibility of developing and maintaining good circulation by massage in any organ of the body not afforded good functional stimulation in addition to relief from disease influences, is regarded generally with skepticism. Granted relief from disease influences and good functional stimulation, then good circulation is generally conceded to follow. In the light of these axiomatic statements, one might well wonder why periodontal considerations are made exceptions by some. On what *scientific evidence* can this be justified?

JOHN OPPIE MCCALL, D.D.S.

New York, N. Y.

The series "In Our Opinion" is arousing deserved attention. The questions raised are important and the need for discussing them is brought out by the sharp differences of opinion voiced by competent observers as, for example, in the recent discussion of persistent pockets. However, in the present instance it is difficult to see how there can be a difference of opinion. The benefits of massage of the gingival tissue, both in the prevention and the curative treatment of periodontal disease are well-known and have been utilized for many years.

I think it may be taken as a truism that vigorous, i.e., fairly rapid, circulation is a fundamental requisite for tissue health in any part of the body. Good tissue tone is dependent on an adequate supply of nutrient material and adequate disposal of tissue waste. Neither of these requisites can be had if the local blood supply is sluggish.

Exercise, whether taken consciously as such or as work, produces stimulation of the part being exercised. This is through the medium of muscular effort. Tissue adjacent to the muscles being used will respond, as to their circulation, in some degree according to the extent to which their blood vessels are influenced by the nearby stimulation.

In the case of the gingivae there are no muscles passing through them or inserted near enough to them to provide this direct influence. However, there are two factors related to functional use of the teeth which can act on the gingival circulation, especially that of the marginal and cemental gingivae. One is the effect produced when the teeth are pressed into their sockets when used in incision and mastication. The other is the direct compressing effect on the gingival tissue produced by the passage of food over the enamel surface after each incisive or masticatory stroke.

Vigorous mastication of food which requires vigorous mastication for reduction to digestible form provides both of these circulatory stimuli automatically and may be presumed to constitute the natural means for developing high tissue tone and maintaining gingival health. However, with the modern tendency to "tenderize" all foods this natural method of stimulation of the gingival circulation becomes entirely inadequate for the needs of the situation. Massage must therefore be resorted to in order to make up the deficiency.

Clinically, the benefits of massage are unmistakable. Speaking first regarding prevention, I have seen many mouths in which, by the appearance of the tissues and by the patients' statements, vigorous toothbrush massage has been constantly practiced over an extended period. In these cases the gingivae were firm and presented a healthy ap-

pearance, with no noticeable evidence of inflammation and with pocket formation absent or of a minor depth. In many of these cases it was evident that factors tending to cause periodontal disease were present, but that resistance to disease was high. In some of these cases the toothbrush had been used in such a manner as to produce varying amounts of gingival recession. Yet no harm had come from this aside from the unfortunate appearance thus produced. And, on the other hand, there had been definite protection from deeper disorders.

When faced with a case of full-blown periodontal disease, with gingival inflammation and pocket formation, the periodontist who does not invoke the aid of gingival massage faces difficulties in treatment, slow recovery from the disease and almost inevitable recurrence of the original condition.

Just a word about the relationship between tooth cleaning and massage. As a practical matter the two are inseparable, in the sense that if the tooth surface is thoroughly and completely cleaned the operation necessarily involves contact of the cleaning implement, whether brush, wood point or rubber device, with the marginal gingival tissue. Almost inevitably this contact produces fairly marked compression of that tissue, which means massage. It is easy, however, to think that the state of cleanliness produced, i.e., the removal of infected mucus, etc., is responsible for the improved gingival health observed. But if tooth cleaning could be accomplished without producing gingival compression or, in other words massage, it would be found that its effect, as far as the gingivae were concerned, would be almost entirely negative.

It must be understood, on the other hand, that massage which is usually given in the course of, and as a part of, tooth cleaning, produces consciously a greater effect than even thorough tooth cleaning alone. Its effects on the gingivae are obviously positive and beneficial. This is true even when it is not done with the greatest skill. If practitioners will analyze this relationship they will realize the necessary parts played by both tooth cleaning and massage and will then develop their concept of massage in such a way as to realize to the full the beneficial effects of this most valuable agency.

BALINT ORBAN, M.D., D.D.S.
Chicago, Illinois

I agree with the "Initial Statement" that gingival massage is a fundamental factor in maintaining gingival health. I would answer the three arguments brought up by Leonard as follows:

1. It is true that it is contrary to good medical practice to massage an inflamed tissue but this is mainly true for acutely inflamed tissue. No one would begin the treatment of an acute gingivitis (mostly ulcerative of the Vincent's type or possibly staphylococcus infection) by massage. No one with any biologic sense would try to break down nature's defense mechanism, the lymphatic blockade, built up by an acute inflammation against the spread of infection. One would first treat the acute symptoms by medication and removal of the local irritation and after the acute symptoms had subsided, then initiate massage.

2. It is true that the gingiva heals perfectly after extraction of a tooth, even one affected with the severest periodontitis, but this is no proof that the gingiva will heal after removal of irritants from the root surfaces. After extraction of a tooth, the gingiva heals without additional treatment because the pocket was eliminated by extracting the tooth which had formed one side of the pocket. No gingivitis or periodontitis can exist without a tooth.

3. I cannot agree with the assumption that the inflamed gingiva contains bacteria. There are no bacteria in the tissues; the bacteria are in the pocket and on the surface of the necrotic pocket epithelium. It is true that bacteria and their toxins can be pumped into the circulation through the blood vessels in the gingiva. These blood vessels are very superficial in gingivitis and periodontitis. Such bacteria, if they get into the circulation, are mostly made harmless, for instance in the liver and the spleen, and they could only lead to trouble if lodged in some other organ inflamed or damaged at the time, thus presenting a *locus minoris resistentiae*. However, the chances for such an infection are small. Another unpleasant condition, resulting from the pumping in of bacteria into the tissues, is the sudden development of a periodontal (lateral) abscess.

It is therefore essential to remove irritation from the pockets to reduce the number

of bacteria and acuteness of the inflammation. After this is done, massage can be initiated. Massage is exercised to increase the speed of circulation, to provoke active hyperemia, and thus increase tissue ventilation and transport of waste products. By repeated friction upon the surface of the gingiva (especially the papilla) the resistance of the gingiva will increase by improvement of surface hornification. (This is of special importance following an acute ulcerative gingivitis of the Vincent's infection type.)

In addition to massage in maintaining gingival health, the most important feature is keeping the teeth free from materia alba (mucin, leukocytes, epithelial cells and bacteria). The cleansing of the tooth surfaces is automatic if the massage has been carried out properly. I think it is beyond the scope of this discussion to go into the technic of massage before an agreement on the basic principles has been reached.

R. W. RULE, D.D.S.
Glendale, California

The question, "Is Massage a Valuable Treatment in Gingivitis and Periodontitis?" will be considered further down in my discussion.

To begin with, I cannot agree with Dr. Leonard that the conservative local treatment of periodontitis consists, or has consisted essentially of removing irritating matter from the root surface, of correcting occlusal traumatic factors, and of stimulating a restoration of circulation in the areas of inflammatory change by massage.

What, for the moment, I take particular exception to is the phrase, "essentially of removing irritating matter from the root surface" for I have repeatedly noticed it or its practical equivalent in Dr. Leonard's statements and feel that this is an opportune moment to bring it into consideration. (See *J. Periodont.* Oct. 1945, pp. 141-2. Also, Sup. to Jan. '43 issue, p. 5, 2nd par. of Statement and my comment in next to last par. p. 10.) It seems to infer that the mere removal of irritating matter comprises the whole instrumentation portion of the treatment. This is to overlook the really essential factors in this type of work.

For thirty-five years or more, some of us have been teaching that the most successful treatment for chronic periodontal lesions is based on the simple but exacting principles of surgical treatment of suppurative wounds. Simply and briefly stated, these are: (1) Removal of all irritants. (2) Cleansing of the wound. (3) Surgical freshening of the surfaces of the tissues involved. (4) Inducing a blood clot which must have opportunity to organize. (5) As near surgical rest as it is possible to obtain. Without numbers 3 and 4, rapid healing with organic union cannot take place. Moreover, rarely will these two things be present (as it were, by accident), at the end of the treatment where the objective of instrumentation is only the removal of irritating matter from the root surface. If massage of the area were to take place at the time of the instrumentation or soon after, it would either hinder the clot to organize or break it up after it had organized. In either case, a rapid organic healing would be prevented. A slow and partial healing might take place from the bottom of the detached area.

In paragraph four of the "Initial Statement" it is said: "Until the tissue is restored to health, the gingiva hangs loosely around the root and tissue fluid continues to exude into the sulcus thus giving rise to further accumulations of bacterial and fungous slime on the tooth surface." This can occur but when it does, it is obviously through a failure to obtain the *primary objective* of "Constructive" treatment. If a favorable blood clot is formed and remains undisturbed through massage or any form of trauma, it naturally prevents all that is stated in the above quotation and the healing process begins at once. On the other hand, we have only to consider what would take place in a wound in some other part of the body if the wound were only cleansed, without surgical freshening or coaptation of the parts, to see the parallel to the conditions stated in the above quotation. A healing by first intention could not take place. At best, any healing at all would be by second or third intention and in periodontal cases, would be only an adaptation of the parts and not an organic union.

Going back to the original question, gingivitis and periodontitis cannot be classed as one regarding their treatment, not even as to the question of massage.

In acute gingivitis, especially of the ulcer-

ative type, massage during the acute stage would be a gross error. In chronic gingivitis, massage is also contraindicated at time of treatment. On the other hand, where the instrumentation is carried out thoroughly and without undue laceration of the tissues it is astonishing how rapid is the response to treatment. Within the hour that the patient sits under treatment, the tissues will lose their congested appearance and return to normal hue, and a healthy tone and firmness is usually evident within 24-28 hours.

I have seldom found it necessary or advisable to stress massage by the patient. Mastication of the food should give the massage which the tissues require for good health and tone. Where patients, for various reasons, could not or would not use and masticate well such foods as would give the desired massage, I have sought to give them a brushing technic, with a medium bristle brush of suitable type, to produce the desired stimulation, but never during periods when blood clot organization and healing were taking place.

The fact that the gingival tissues, in treatment of gingivitis, almost immediately lose their tenderness and soreness, and that in cases of deep surgery (conservative or "constructive" type) the soreness seldom lasts more than twenty-four hours is evidence that the inflammatory processes rapidly subside with the treatment. Massage of any kind during the period that the tissues need surgical rest would be definitely detrimental to the healing conditions.

It is difficult to deal adequately with this subject in a short discussion but I have sought to make myself as clear as one can in so brief a space.

As to the arguments of the members, stated in the second paragraph of the "Initial Statement", I stand fully with number one, also with number two if treatment is complete and not restricted to mere removal of irritants. As to number three, if the true principles of surgery have been well carried out in the treatment, the vessels and tissues will have disgorged themselves of their stagnant contents in the earlier moments of the treatment and nature will take care of the few remaining organisms so that "bacterial endocarditis" will not need to be feared. Healing will take place rapidly, but there should be no massage at this time. However, if serious heart lesions are known to be present, only small areas should be involved in treatment at any one time.

CHARLES H. M. WILLIAMS, D.D.S.
Toronto, Canada

The regularity, with which speakers or writers on the subject of periodontal therapy stress massage-brushing technique as an absolute essential to the production and maintenance of successful results, causes one to think that our therapeutic procedures must be somehow inadequate. The evidence presented in the mouths of older people, both primitive and modernized, who have never brushed their teeth, who have masses of visible calculus, and who still have an approximately undamaged periodontium, leads me to believe that there is an attainable ideal whereby the periodontal tissues may possess such an inherently good health that the artificial assistance of regular massage should not be necessary. This statement is not intended to suggest that I have attained, or have even closely approached, this ideal, but I do believe that it should be our objective.

Point No. 1. With respect to the first point mentioned in the second paragraph, Doctor Leonard agrees that it is not good *medical* practice to massage acute inflammation, but that massage of areas exhibiting chronic inflammation may be beneficial. We are of course frequently confronted with the paradox of gingival tissues which exhibit most of the classic clinical signs of an acute inflammation, but the inflammation has often existed over a long period and the microscopic evidences are mainly those of a chronic inflammation. In other words, most of the gingivitis with which we deal, might be considered as an evidence of chronic inflammation, and massage is not so strongly contraindicated.

Point No. 2. Suggests that if the irritants are sufficiently removed, as by extraction of teeth, the alveolar and gingival tissues heal perfectly without massage. This point seems to be well supported.

Point No. 3. The possibility of inducing bacteremia by massaging over infected areas is a very important one. The works of Fish and Graham in England and also of Bartels, seem to indicate that the periodontist has a great responsibility in preventing and con-

trolling bacteremia. It has become our practice to reduce infection, at least in the obviously septic mouths, by the use of medicated packs before employing operative procedures. We believe that a division may be made between the extensive and deep-seated infections, and the less extensive superficial inflammations and infections. As Doctor Leonard has suggested, cleaning and massaging will lead, in most cases, to quick healing of the superficial tissues. If gingival massage is employed in cases of superficial inflammation and infection, there is undoubtedly a period of a few days during which the patient has a bacteremia which is increased over that which would have resulted from chewing function alone. However, this temporary increase in the bacteremia is possibly justified by the marked reduction of the distribution of bacteria and toxins which follows the re-establishment of an intact, keratinized epithelium. In these cases we seem to be gambling a short period of increased bacteremia against a prolonged period of less intense bacteremia. It is likely advisable in all septic conditions to reduce the bacterial count as a preliminary therapeutic procedure but certainly in the more deeply seated cases, as stated previously, I believe that the infection should be reduced and the periodontal tissue quality improved before the introduction of massage procedures.

The suggestion that gingival massage with the toothbrush might be considered as an acceptable substitute when the stimulus which should normally be provided by vigorous function on coarse foods is missing, seems reasonable. Wherever possible, it is preferable to encourage the patient to employ a vigorous occlusal function on coarse foods. Vigorous occlusal function, in addition to its stimulation to the gingival tissues, is significant to the health of the periodontium, because of many influences which the toothbrush cannot produce.

DANIEL E. ZISKIN, D.D.S.
New York, N. Y.

I have no quarrel with the recognized conservative local treatment of gingivitis and periodontitis in so far as it consists essentially in the removal of irritating matter from root surfaces, the correction of occlusal traumatic factors, or proper methods of brushing the teeth. Neither do I minimize the possible benefits of massage or stimulation of tissue circulation under conditions where they seem indicated, medically. But I take strong exception to the use of massage on highly inflamed gum areas—a practice which has been thought for many years to have health-giving action, but whose physiological responses remain obscure.

Doctor Leonard has already cited three important arguments which I, as well as others, have advanced in repudiation of this procedure. (See his paragraph 2). These arguments are still valid. But there are others as well. In the "Initial Statement" we are given a step by step account of what happens to inflamed gingivae after massage has been instituted. A definite physiological pattern, ending in healthy gums, is described. But the scientific proof of these claims has never been established. They are merely theory. Even as an hypothesis some of the allegations brought forward lack soundness. For example, in paragraphs 4 and 5 Doctor Leonard deals with the restoration to health of zones of chronic inflammation. He speaks of "permeable capillaries plugged with red blood cells, lymphatic channels plugged with fibrin", etc. The idea conveyed is that the compression and release massage will force these red blood cell plugs and fibrin plugs into the circulation, thus opening the capillaries to arterial blood. If this were an accurate statement of the pathological picture that exists in chronic gingival inflammation and the results achieved by means of therapy with massage, the effect would be one of subjecting the system to showers of emboli. The gravity of such a response is, of course, obvious.

Doctor Leonard also seems confident that "the transudates are forced into the lymph vessels" as a result of compression and release massage. While we assume that there is a system of lymph drainage, we do not know how excess tissue fluid enters these vessels. Hence I do not believe we are justified at the present time in maintaining that it is "forced into the lymph vessels" by means of massage or any other means. It is apparent that we have built up and accepted a set of practices without adequate scientific approval either for the terms employed or the results obtained. And in my opinion it is time the practitioners and educators in

periodontology concerned themselves seriously with research studies which might eventually give us a body of data that would clear up some of the now controversial issues.

My criticism is directed against the unsubstantiated evidence advanced in describing the effects of certain therapeutic procedures. "Gingival massage", as defined by Doctor Leonard, falls within this category.

Concluding (?) Statement

To prepare an opinion on a controversial subject and send it to those most likely to have a contrary opinion is certainly asking for brick-bats. But I do not mind. I have no idea that I am omniscient in these matters and I know of no better way to get the errors in my own thinking corrected.

I am glad that Dr. Ziskin was able to contribute even though ill and sorry that I did not hear from Dr. Rosebury. I appreciated greatly Dr. Lyons contribution. I always learn something when he disagrees with me. I expected his scholarly castigation. I was, however, surprised at disagreement from Dr. Rule.

In reply to Doctor Rule's opinion let me say that I was taught in my student days the idea that the blood clot in the treated pocket was most valuable and on no account to be disturbed until it had organized. To protect it a coating of creosote and iodine followed by tannic acid and glycerine was applied over the treated teeth and gingivae and it was supposed to last for several days. Harold Box carried that idea further by curetting out the lining epithelium of the pocket and depending on an organizing blood clot to serve as a matrix for new formation of connective tissue, cementum, and alveolar bone.

I have noted in former discussions in this department the necessity for occlusal function, equilibrium, and support for tilted teeth, the need for vigorous use of the teeth in mastication, the value of good general nutrition, and freedom from systemic disease. The Eskimos have excellent periodontal function on their native diets and no periodontal pockets according to Leuman Waugh (Personal communication) although salivary calculus formations may cause recessions leading to loss of teeth. But we are not Eskimos and it is useless to attempt to get patients to eat foods which would give the periodontal function the Eskimos get.

The massage which my patients give with the toothbrush stimulates an increased blood flow to the gingivae and periodontal structures. Following the brushing and massage technic within a few seconds one can see the deepening of color of the gingivae. If a purple hue was present it is replaced by red. There is a good feeling following massage as though "the gums tingle with health," as patients express it. This increased blood flow which is the effect of massage with the toothbrush is a physiologic response to a nervous stimulus in addition to the fact that capillaries have been emptied by compression. In so far as the area of increased blood flow extends it is just as beneficial as increased periodontal blood flow which is the result of masticatory function. The important thing is that the blood flow is increased, for the vigor and vitality of a tissue depends on the vigor of its blood flow.

Soreness and tenderness of a tissue is a symptom of disease or decreased vitality. Soreness around the teeth to pressure soon disappears when the sore areas are stimulated to vigorous blood flow by massage. Tissues get dense and tough with handling. The boxer, the wrestler and the tumbler develop by continual pounding of the body tissues, a resistance to blows which is amazing. I believe the same principle applies to the gingival tissues. The gentle pounding of the toothbrush on the gingival margins stimulates a vigorous blood flow, producing vigorous tissues. The connective tissues become dense, the epithelium intact, and the bone develops a cortical plate. Whether or not the toothbrush massage is similar to any natural function the fact is that it does stimulate an increased healthy blood flow where it is most needed. The results in all signs of health in the periodontal tissues confirm its benefits. Without artificial massage, I have found no means to restore the circulation or otherwise get health in many congested sore areas about the teeth.

Further Discussion on this Subject in the July Issue

The subject of massage is so intimately related to the periodontist's practice that every one must have some opinion on it based on his reading and experience. Some of those who were asked to discuss the subject for the April issue of the Journal wished to wait until all other discussions were in, and then write an opinion. The Editor and Discussion Leader have therefore decided to open the list to other members of the Academy and also to readers of the Journal who have additional opinions which will contribute to this subject.

The Editor requests that all who take part in this discussion prepare their contributions for publication and not in the form of a letter to the Leader. All copy should be typed double spaced and signed by the author.

Such contributions should be in the hands of the Discussion Leader by June first. The Leader reserves the right to select and edit but greatly desires the opinions of all periodontists who have thought deeply on the subject under discussion.

Harold J. Leonard, Discussion Leader
745 Fifth Avenue, New York 22, N.Y.

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Editorials

A New Journal Makes Its Bow

THE JOURNAL OF PERIODONTOLOGY welcomes the fine Journal, *Oral Surgery, Oral Medicine, and Oral Pathology*. It is the successor, or rather the continuation of the Oral Surgery Section of *The American Journal of Orthodontics and Oral Surgery*.

The editorial staff is only slightly changed from the original group, but Daniel J. Holland, Jr., serves as assistant to Editor-in-Chief Thoma, and valuable additions have been made to the associate editors.

The editors of the three groups for which the new Journal is the official organ, are Dr. Kurt H. Thoma for the New England Society of Oral Surgeons; Dr. Hermann Becks for the Seminar of Oral Medicine, and Dr. Hamilton B. G. Robinson for the American Academy of Oral Pathology.

The first issue, which is sub-titled "Massachusetts General Hospital Number" is devoted largely to reports of surgical cases by the hospital staff. It contains in addition a Quarterly Review of the literature which is to be a regular feature of the Journal's contents. In the January issue this department consists of an excellent "Collective Review" of the subject of Penicillin in Dentistry by Goldman and Guralnick; several brief reviews of new books and some 20 pages of Abstracts of Current Literature.

The format of the Journal is good and the few pages of advertising matter are consistent with the dignified character of the publication.

—C.R.

Discussion a Remedy for Confusion

IT IS to be hoped that much of the confusion in the minds of dentists and patients, as to the value of gingival massage, will be resolved by the current discussion appearing in this Journal. Because of the need for a decision on the subject, an unusual amount of space has been allowed, and yet the question is not decided and the reader will still be perplexed. The subject will be continued in the July issue and with the aid of a moderator perhaps a satisfactory agreement can be reached.

On the one hand we have the overpositive statements of the clinician who, because of his personal experience, believes in the importance of gingival massage. Opposed to this attitude, there are statements presented by a purely scientific approach demanding proof for claims based largely on experience in practice.

Fauchard recommended gingival massage two centuries ago and we are arguing about its value today. Periodontal diseases present so many variables that good judgment would seem to question the use of any therapeutic procedure for all of them, regardless of its value in many cases. —G.T.S.

BOOK REVIEWS

***Dental Caries*, Its Etiology, Pathology, Clinical Aspects and Prophylaxis.** *By* Bernhard Gottlieb, M.D. (University of Vienna), Hon. (University of Bonn.), LL.D. Hon. (Loyola University, Chicago). Lea & Febiger, Philadelphia: 1947.

When a recognized authority in dental pathology publishes a scientific paper or a book of many chapters dealing with a subject in which he has devoted a large part of a lifetime in study and investigation, the profession is given the opportunity of acquiring important scientific knowledge in a few hours that required years of intensive study and research to produce. The opportunity of individual study of histological material is not available to a large majority of the dental profession, therefore the publication of such a book as Dr. Gottlieb has presented on a subject of great controversy and difference of opinion affords the reader a chance to study and reflect upon the intricate subject of dental caries and ask himself if we have been doing all we should to control this universal disease.

Dr. Gottlieb bases his approach to the disease of dental caries, that eventually destroys the pulp, upon the organic matter contained in the enamel and dentin, suggesting that the teeth are stoppers for the holes made through the epithelium when they erupt, they must fit perfectly or microörganisms will invade. Since the enamel contains about five per cent of organic matter consisting of prism sheaths, tufts, and lamellae these become the pathway for the entrance of microörganisms into the dentin which is composed of a high per cent of uncalcified organic matter. These uncalcified channels become the invasion roads to the pulp and thence directly into the body. His theory of caries prophylaxis depends upon the complete obstruction of these invasion roads by impregnating them with an insoluble substance to prevent bacterial entrance and decomposition of the organic matter.

By the aid of color photography a differentiation is shown between caries caused by the entrance of microörganisms, which is attended by a yellowish brown pigment, and acid production which is observed in chalky enamel. The proteolytic microörganisms act when these organisms are not active and the chalky surface of the enamel (which is not caries) occurs, but if the organisms are able to enter by means of an uncalcified prism sheath or lamella, *real* caries follows. It is interesting to note Dr. Gottlieb has had the experience most operators have had in regretting an attempt to prepare a cavity in chalky enamel which he now states should not be attempted unless the dentin is affected, since calcium from the saliva often remineralizes these areas. The disintegration of the enamel cannot penetrate deeply because a strip of hypercalcification produced by the acid action serves as a reliable barrier.

In Chapter III, after a well-illustrated discussion of the development and structure of the enamel of Chapter I and acid action on enamel in Chapter II, the theory of enamel caries is fully developed.

The yellow pigmentation of enamel caries is "the earliest characteristic of dental caries and it remains as long as caries is present". The process can be arrested in the enamel or dentin. This can be accomplished by nature by calcium impregnation or artificially by precipitation of a water soluble metallic salt into the organic invasion roads. The presence of heavy deposits of dental calculus often closes invasion roads resulting in caries immunity. Such immune areas under calculus deposits may become susceptible to caries after scaling and should be impregnated with some protective substance. The quality of the saliva may no longer be protective. The pits in children's teeth, should be impregnated as early as possible.

In Chapter IV, Dr. Gottlieb shows how the shifting of calcium salts due to acid action erects barriers against the progress of proteolysis. These barriers are the light transparent enamel which is a weak barrier and the opaque layer in the dentin which surrounds a light area and is hypercalcified. The latter serves as a true barrier against the progress of caries and often protects the pulp from exposure. In rapid developing caries of the young person nature may not have time enough to produce this shift of calcium salts and the pulp often succumbs

to the invasion. In Chapter V is shown how dental caries is arrested by the hypercalcified barrier. In his treatise on clinical application, Dr. Gottlieb states that this hypercalcified area, being nature's own protection, is a sufficient guarantee that caries has been checked and beyond this the cavity need not be extended in the dentin. Although this dentin may have a yellowish tinge it does not have the spearhead shape which points beyond the hypercalcified barrier.

The author quotes a recent report that the staphylococcus aureus produces dental caries. It produces the yellow pigment, which characteristic is always present in caries, and causes necrosis of the organic material. He strengthens this conclusion from the fact that this organism is known to have invasion ability as seen in osteomyelitis.

Another interesting point is brought out in Chapter VII in regard to the function of the odontoblasts and the formation of secondary dentin. To quote:

> The odontoblasts normally form a separating layer between the connective tissue of the pulp and the dentin which it forms and thus slow down dentin deposition. If the odontoblasts are damaged and are made to degenerate, the separating layer is eliminated in differing degrees, the connective tissue of the pulp comes into better contact with the dentin and can deposit more dentin. Thus the increase of dentin deposition in secondary dentin is not due to stimulation but due to damaging of the separating layer of the odontoblasts. If, however, the damage is increased and the connective tissue of the pulp is harmed also, no more secondary dentin is deposited. A further increase of the damage may produce necrosis of the pulp, which is a common clinical observation.

Frequent clinical observations have also been made of teeth in which the pulp seems to be entirely obliterated by deposits of secondary dentin which might be ascribed to the degeneration or disappearance of odontoblasts. In the dentin of opalescent character, which seems to be inherited from one generation to another, the dentin has no tubules and the odontoblasts are inactive or missing, hence the pulp chamber and canals are soon obliterated by hard tissue.

In Chapter IX the theory and technic of impregnating the invasion channels is developed as a means of caries prophylaxis. Silver nitrate alone is shown to be only partly successful in obstructing the channels and also has been found to be carried away in time by circulating fluid. Ammoniacal silver nitrate followed by five per cent formalin was found to act better. However, this combination did not reduce the acidophilous count. The precipitation of silver nitrate with a saturated solution of calcium chloride seems to be the best for the "silver nitrate principle". As a substitute a 50 per cent zinc chloride solution may be precipitated with a 10 per cent solution of potasium ferrocyanide.

The reduction of hypersensitive dentin and caries prophylaxis are accomplished at the same time and by the same method. Sensitiveness to sugar on certain areas of the enamel surface indicates a change in osmotic pressure at the dentino-enamel junction and such sensations indicate open channels vulnerable to invasion of microörganisms that produce caries. The recommendation is made to impregnate such areas after which sugar will have little effect upon the teeth.

The last chapter deals with the problem of fluorine and the teeth. It is illuminating and instructive regarding the principles underlying the use of fluorine for desensitizing and for caries prevention. The affinity of fluorine for calcium makes it to be classed as a dangerous element and to attempt to derive a benefit from the insoluble calcium fluoride is shown to be illogical. The effect of fluorine in the production of mottled enamel is shown and explained. The suggestion is also made that there is some evidence to indicate that drinking water with too high content of fluorine may cause periodontal disturbances. The basis upon which benefit may be derived from fluorinization of teeth is said to be from the attraction of calcium from the surrounding tooth tissue into the invasion channels in the enamel, the prism sheaths, and the lamellae.

The book is illustrated with excellent histological and clinical pictures. There are 222 of such illustrations and seven plates of colored illustrations containing 59 examples of color photography which add much strength to the text and assist in clarifying some statements.

Dr. Gottlieb has contributed much to scientific dental literature for several decades. His writings are the product of a scientific mind and the work of a tireless investigator. He has inspired many younger men to achieve something for the science of dentistry while he himself always retains his position in the innermost circle of scien-

tific investigators, each of whom doubtless feels the stimulation of his vigor and enthusiasm and the challenge of his statements. His book, *Dental Caries*, like his earlier work, *Diffuse Atrophy*, will be a source of reference for many years to come. Every dental practitioner, teacher and student should read and study this text.

—Edgar D. Coolidge

The Surgeon Dentist or The Treatise on the Teeth. With Observations and Reflexions on Several Special Cases. A work enhanced by forty-two illustrations. *By* Pierre Fauchard—Surgeon Dentist in Paris. Translated from the Second Edition, 1746, by Lilian Lindsay, C.B.E. LL.D., M.D.S., H.D.D., L.D.S., Hon. Librarian, British Dental Association. London: Butterworth & Co. (Publishers) Ltd., 1946. 312 pp.

The publication of Lilian Lindsay's translation into English of Fauchard's *Le Chirurgien Dentiste* is an event of no mean importance to the dental profession.

We English speaking dentists now for the first time have a complete translation into our own language of this valuable "heritage of the past." The translator, the widow of a prominent British dentist, Robert Lindsay, is herself a member of the British Dental Association and last year was President of that organization. She was for many years Librarian of the B.D.A. and is the author of "A Short History of Dentistry" (1933) and other historical papers. She was in every way qualified for the task which she so well executed. Dr. Lindsay is well-remembered by those of us who were fortunate enough to have met her during her visit to the Chicago Convention in 1933, and at other meetings, abroad, as a modest little lady of most delightful and charming personality.

Pierre Fauchard was born in Brittany in 1678, died in Paris in 1761. At the age of 16, he was apprenticed as a student surgeon in the naval health service where he was fortunate to be under the guidance of M. Alexandre Poteleret, an expert in diseases of the mouth and from him Fauchard got his first "glimmerings of knowledge in surgery".

Dentistry in France, at the beginning of the 18th Century, was largely in the hands of mountebanks and these spectacular charlatans pretty well submerged the few scientific practitioners. Fauchard joined this small group of scientists when he moved to Paris, where, as early as 1719 his reputation was well-established both as a dentist and as a consultant. Patients came from afar to seek his advice and his ability brought him into contact with the best surgeons of his day.

Fauchard greatly deprecated the fact that the skillful and learned men who preceded him left no written record of their knowledge, and it was with the idea of overcoming this lack that the book was conceived which gives him his chief claim to fame.

The manuscript was completed in 1723, but Fauchard discussed every part of the book with other experts before publishing it in 1728.

Le Chirurgien Dentiste was the first complete treatise on dentistry and in it Fauchard attempted to incorporate everything of value in the records of dental practice, adding to this fruits of his own experience.

The practice of withholding information, patenting inventions, and "all the tricks of the market-place" which had long been considered unethical by the medical profession, were now outlawed and dentistry was brought to the level of a true profession.

The book was criticized by those who were used to thinking of professional information as a species of trade secret; but following Fauchard's example other dentists began to share their knowledge, and by means of lectures and essays spread information.

Dr. Lindsay's translation is from the 2nd edition published in 1746, two hundred years ago, one hundred years before the founding of the first dental school! And if this review has gone at considerable length into the background of the work, it is because it must be evaluated with due regard to the period in which it was written. Even so, our twentieth century complacency may well be jarred by the extent of Fauchard's information, by the keenness of his observation, by his talent for critical examination and appraisal of all sides of a question, and by his amazing versatility.

The chapters on surgery accompanied as they are by detailed case reports ("observations and reflections") would entitle Fauchard to a place in the Academy of Oral Surgery; while his mechanical skill and ingenuity in the matter of all kinds of pros-

thetic appliances, from single pivot teeth to full dentures and including obturators for cleft palates, is such that a certain Mons. B. Platschick of Paris was moved to present a very fine paper on the subject of "L'Oeuvre de Pierre Fauchard dans la Prothese Dentaire", before the Fourth International Dental Congress in St. Louis in 1904.

On the subject of diet we told that "confections, drages and all sugars contribute in no slight measure to the destruction of the teeth" and further, "it may be remarked that those who indulge in these seductive poisons are subject to disease of the teeth and lose them sooner than others." And "it is no less important to be temperate in drinking as in eating, if religion and duty do not constrain us, the consequences of excess are sufficient to render us sober, regular and capable of self-restraint." But, lest we attribute to Fauchard too great a knowledge of modern diet we find on the next page the following: "Too much indulgence in vegetables such as cabbages, leeks, shallots, turnips, green peas, flesh of pork, salt fish, cheese, milk are prejudicial to the teeth since all these things produce bad chile."

In the field of Periodontia, Fauchard has much to say. "Tartar once it is formed increases every day by new layers. And if removal is delayed, it forces itself between the gums and teeth and by lodging there, inflames and swells the gums. The consequence of this is the teeth are pushed out and become loose." "Often after removing the tartar that covers the teeth, some is left between gums and teeth and this must all be removed to check the inflammation." Traumatic occlusion claimed his attention. "If there is one tooth which is longer than its neighbor, it shocks that against which it strikes; both these teeth may become loose as a result and the others will only be able to masticate imperfectly." "They must be filed in such a way as to adjust them to those opposed to them, etc."

Fauchard's interest in scurvy dated from his association with Poteleret and his early days on shipboard. He discovered that the disease was of two kinds, one of systemic origin which could be controlled by internal remedies but, he says, "There is a kind of scurvy of which, I think, no author has taken the trouble to speak, and which without involving the other parts of the body attacks the gums, alveoli and teeth." There follows an accurate description of what has been called pyorrhea and which we know today as purulent periodontitis.

Fauchard observed that those treated for this complaint with internal remedies were not cured and deduced that its origin was local or accidental and caused by the teeth. The loss of the teeth can be avoided by the following means: "That is to keep the teeth very clean, deplete the gums when they need it by rubbing them vigorously every day with the end of the fingers" dipped in certain medicaments. Without proper care the pus will consume the alveoli, so that the teeth become loose and fall out.

Fauchard has this to say about the gums: "The gums conserve the teeth. They contribute also to the ornament of the mouth when they are well formed and scalloped in semi-circles. When they are displayed in laughing they spread out in a scarlet fan which relieves the dazzling whiteness of the teeth, and are, reciprocally, relieved by the whiteness. This contrast in colour, with the order and regularity of the teeth, and the edge of the gums offer a most gracious picture to the view."

After enumerating the various operations practiced on the teeth, Fauchard says, "All these operations demand for him who would exercise them a light, sure and skilful hand and a perfect theory. They demand knowledge as perfect as it is rare in order to decide what is suitable, to delay or to abandon operation altogether." This description seems admirably to fit Fauchard himself as he is revealed to us through the effort and industry of Dr. Lindsay.

In closing this review, I wish to quote from the remarks of Dr. William H. Truman in his discussion of Dr. George Viau's essay, "A propos of a Portrait of Pierre Fauchard."

> We honor Fauchard, not for his great skill, skillful as he undoubtedly was, and well-versed in all that is embraced by the term 'dental surgery'. In this he may have been equalled, perhaps excelled, by some of his compeers whose names have long been forgotten. We honor him for the noble and unselfish spirit which prompted him to this task, and for the earnestness displayed in making known to his compeers and freely placing at their disposal all that he had learned, and all that he could persuade others to impart that might be helpful to them in their daily practice. His work inaugurated a new era. Fellow practitioners, inspired by his example, ceased to be competitors and became compeers, each anxious to help the other to increase their own usefulness and the usefulness of their calling.

—Celia Rich